

# Contract Documents

Town of Arlington, MA

Menotomy Fountain Rehabilitation

March 2018



Weston & Sampson Engineers, Inc.  
85 Devonshire Street; 3<sup>rd</sup> Floor  
Boston, MA 02109  
[www.westonandsampson.com](http://www.westonandsampson.com)  
Tel: 978-532-1900

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**TOWN OF  
ARLINGTON  
MASSACHUSETTS**

**INVITATION TO BID**

**BID No. 18-10 MENOTOMY FOUNTAIN  
REHABILITATION**

Sealed bids for Menotomy Fountain Rehabilitation for the Town of Arlington, Massachusetts, will be received at the Purchasing Department, 730 Massachusetts Avenue, Arlington, MA 02476 until **11:00 AM prevailing time, on Thursday March 29, 2018** at which time and place said bids will be publicly opened and read aloud.

**A pre-bid meeting will be held on 03/14/2018 at 01:00 PM. All pre-bid questions shall be submitted in writing via email to the engineer by 12:00PM on 03/16/2018. All questions shall be submitted to Mark Mariano at marianom@wseinc.com.**

All bids must be in a sealed envelope plainly marked: **BID No. 18-10 MENOTOMY FOUNTAIN REHABILITATION.**

The scope of work includes the selective demolition of the fountain lower basin, hydraulic equipment, electrical equipment, hatch cover, pruning, trimming, and tree removal, and removal of specialty historical masonry. Storing of the existing stone masonry, brick pavers, and blue stone coping stone. The construction of a new lower basin, hydraulic system, electrical system, bonding system, restoration of the upper and mid basin, plantings, brick walkway restoration, new collector tank, and new vault hatch cover. Project is a historical restoration. The Contractor shall have extensive experience in historical restoration.

Add Alternate #1 includes the furnish, installation, and maintenance of landscaping found in the grotto area and includes the furnish and installation of decorative temporary fencing.

Add Alternate #2 the furnish and installation of the concrete foundations and safety winter cover.

***Bid Security in the form of a bid bond, cash, certified check, treasurer's or cashier's check payable to the Owner, is required in the amount of five percent of the bid, in accordance with Section, INSTRUCTIONS TO BIDDERS.***

The contract duration for the Base Bid is 150 consecutive days. Contractors shall not mobilize and start construction on the site till June 4<sup>th</sup>, 2018.

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Contract Documents and plans are available for down load and review on the Town Website:

**[www.arlingtonma.gov/purchasing](http://www.arlingtonma.gov/purchasing)**

The selected contractor shall furnish a performance bond and a payment bond in amount at least equal to one hundred percent (100%) of the contract price as stipulated in Section 00 72 00

GENERAL CONDITIONS of these specifications.

By-law of the Town of Arlington, Title 1, Article 16, Minority/Woman Workforce Participation in Construction Projects which exceed \$200,000.00 is part and parcel of the bid.

Minimum Wage Rates as determined by the Commissioner of the Division of Occupational Safety of the Executive Office of Labor and Workforce Development under the provisions of the Massachusetts General Laws Chapter 149, Section 26 to 27D, as amended, apply to this project. It is the responsibility of the Bidder, before bid opening, to request if necessary, any additional information on Minimum Wage Rates for those trades people who may be employed for the proposed work under this contract.

All bids for this project are subject to applicable bidding laws of Massachusetts, including General Laws Chapter 30, Section 39M as amended.

The Bidder agrees that this bid shall be good and may not be withdrawn for a period of 30 working days, Saturdays, Sundays and legal holidays excluded after the opening of bids.

The Owner reserves the right to waive any informalities or to reject any or all bids.

TOWN OF ARLINGTON

Adam W. Chapdelaine  
Town Manager

## **INSTRUCTIONS TO BIDDERS**

1. COMPLEMENTARY DOCUMENT
  - A. INVITATION TO BID, including herewith, is complementary to this document and shall be reviewed by bidder for specific instruction which are not repeated herein.
2. STATUTES REGULATING COMPETITIVE BIDDING
  - A. Bidding procedures and award of general contract and subcontracts shall be in accordance with the provisions of Chapter 30, Section 39M and Chapter 149, Section 44A through 44L inclusive, of the General Laws of the Commonwealth of Massachusetts, including all current amendments.
  - B. In the event of any discrepancy or inconsistency between the provisions of these Bid and Contract Documents and the above-mentioned statutes, the provisions of the above-mentioned statutes shall govern. In such event, the application of all remaining provisions not in conflict to any circumstance other than that in which the conflict occurs shall not be affected thereby.
3. BIDDER'S QUALIFICATIONS
  - A. DCPO Certification not required.
  - B. The Contractors' Update Statements are not public records and will not be open to public inspection.
  - C. Due to the specialty nature of this project, only Contractors with historical experience will be able to bid on this project. Please refer to 01 14 00 – Special Provisions for the required qualifications for this project.
4. INTERPRETATION OF DOCUMENTS: NOTIFICATION OF ERRORS
  - A. Interpretations of the provisions of the Bid and Contract Documents will be made by the designer upon written request of any general bidder or subbidder, provided that such request is received by the Designer at least seven (7) days prior to the date of the applicable bid opening, and that the Designer considers such interpretation to be of sufficient importance. Oral or telephone interpretations will not generally be made, and if made shall be strictly informal and not legally valid or binding.
  - B. Such written interpretations shall be in the form of Addenda to the Bid and Contract Documents.

- C. Bidders are urged to communicate all errors and discrepancies found in the Bid and Contract Documents to the Designer. Telephone calls pointing out any such errors or discrepancies will be taken by the Designer, but only for the purpose of receiving the information in order that it may be properly processed, and not for interpretation or clarification.

5. EXAMINATION OF BIDDING AND CONTRACT DOCUMENTS

- A. Each Bidder shall carefully examine the Bid and Contract Documents to obtain a thorough understanding of the work of his bid in addition to the work of related trades. In addition, each General Bidder shall personally visit the site to thoroughly acquaint himself/herself with the conditions as they exist hereon.
- B. Failure of any Bidder to thoroughly examine the Bid and Contract Documents or to visit and examine the site shall in no way relieve him/her of any obligation with respect to his/her bid or of any responsibility assigned to him under the Contract.

6. PRE-BID CONFERENCE

- A. Pre-bid conference will be held at the location and time stipulated in the Invitation to Bid.

7. MODIFICATION AND WITHDRAWAL OF BIDS

- A. Modification of withdrawal of Bids will be permitted after the submission of such bids provided clearly written, readily understandable instructions for same are received by the Owner in writing prior to the time established for opening of such bids. No Bid may be withdrawn after that time, except as otherwise provided herein or by law.

8. ADDENDA

- A. Addenda may be required during the bidding period to modify, clarify or interpret the Bid and Contract Documents. It is intended, but not guaranteed, that such Addenda shall be mailed by the Owner to all persons or parties to whom Bid and Contract Documents have been issued (Bidders of Record). Failure to receive such Addenda shall in no way relieve any bidder from the execution of its provisions. All bidders are cautioned to verify the number of Addenda which have been issued and to secure any needed copies from the Designer before submitting a Bid.

9. FORM FOR BIDS

- A. The Owner will make available, to every person applying therefor, a Bid Form. Each bona fide Bidder will be furnished forms for his proposal upon request. Such forms will be made available at the Owner's office during the regular office hours throughout the bidding period. Bids must be submitted on the forms provided by Owner or of forms included in the bid documents of the Project Manual.

- B. All blank spaces provided on the bid forms shall be filled in with ink or typewriter. Where space is provided, sums shall be expressed in both words and figures. In case of a discrepancy between the two, the written words shall govern.
- C. No interlineations, additional, alterations or erasures shall be made on the forms.

10. ALTERNATES

- A. Each Bidder shall bid on alternatives listed. In the event that any alternate does not involve a change in the amount of the Bid, the Bidder shall so indicate by using the words "No Change" in the space provided for that alternate.
- B. General Bidders shall enter on the form for General Bid a single amount for each alternate, each amount to consist of the total of all the subbidders' amounts for the given alternate plus the amount of for work of the alternate to be performed by the General Contractor.
- C. If alternate(s) are accepted, they shall be accepted in the order listed. The low bidder will be determined on the basis of the sum of the Base Bid and the alternates accepted.

11. SUBMISSION OF BIDS

- A. The Bid Form shall be properly executed and enclosed with the required bid deposit in a sealed envelope plainly marked on the outside with the following information.

Bid For:

\_\_\_\_\_

SUBMITTED  
BY:

\_\_\_\_\_  
(Name of Bidder)

\_\_\_\_\_  
(Address of Bidder)

- B. If Bids are mailed; the above required envelope shall be enclosed in a second envelope identified with the above markings and mailed to the place of bid opening, as described in the Invitation to Bid. Mailed Bids must be received before the time scheduled for opening of Bids.

12. PERFORMANCE AND PAYMENT BONDS

- A. The Performance and Labor and Materials Payment Bonds required of the General Contractor shall each be in the amount of 100% of the contract sum from a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and approved by the Owner.

13. FOREIGN CORPORATIONS

- A. The attention of bidders is called to General Laws, Chapter 30, Section 39L, as amended by Acts of 1967, Chapter 3, under which the Owner may not enter into a contract with a foreign corporation as a subcontractor unless the foreign corporation has filed with the Owner a certificate by the State Secretary stating that the foreign corporation has complied with General Laws Chapter 181, Sections 3 and 5 and stating the date of such compliance.

14. AWARD OF CONTRACT

- A. The Contract will be awarded to the lowest responsible and eligible bidder except in the event of a substitution as provided by under Chapter 149, Sections 44E and 44F of the above-reference General Laws.

15. COMMENCEMENT AND COMPLETION OF WORK

- A. The successful bidder, upon completion of the Contract Agreement, shall commence the work of the Contract at any time after June 4, 2018, after receipt of a written Notice to Proceed issued by the Owner, and shall therefore diligently and continuously carry on the work in such manner as to substantially complete the work on or before November 1, 2018 except as noted herein.

16. LABOR REQUIREMENTS

- A. The attention of bidders is particularly called to the requirements as to the conditions of employment to be observed, the minimum wage rates to be paid under the Contract and affirmative action to ensure equal employment opportunity.
- B. Contractor shall make full good faith efforts to secure at least ten percent (10%) of the Labor and Materials incorporated in the Work from Minority Business Enterprises and five percent (5%) of the Labor and Materials incorporated in the Work from Women Business Enterprises certified by the Commonwealth of Massachusetts and consistent with the Federal Equal Employment Opportunity requirements attached hereto as Attachment A. Satisfactory documentation of such effort shall be furnished promptly upon request by Owner.

- C. The Owner is an equal employment opportunity employer and has an active Affirmative Action Plan (AAP). For more information, direct correspondence to Patricia M. Libby, Affirmative Action Officer for the Town of Arlington.



## BID FORM

For: MENOTOMY FOUNTAIN REHABILITATION (Bid #18-10)

Proposal (BID) of \_\_\_\_\_  
(hereinafter called "Bidder") a corporation, organized and existing under the laws of  
the Commonwealth of Massachusetts.

\_\_\_\_\_ doing business as \_\_\_\_\_  
(corporation, proprietorship, partnership)

to the TOWN OF ARLINGTON hereinafter called "Owner". Gentlemen:

- A. The Bidder, in compliance with your invitation for bids for the Menotomy Fountain Rehabilitation, Arlington Massachusetts, having examined the plan and specifications with related documents and the site of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this Contract on or before a date to be specified in the written "Notice to Proceed" from the Owner, and to complete the work by the end of the 150 Calendar Day. The Bidder further agrees to pay as liquidated damages, the sum of \$ 500.00 for each consecutive calendar day thereafter that the works remains incomplete, as provided in the Instruction to Bidders, Modifications to General Conditions. Required completion dates are as follows:

- B. Bidder acknowledges receipt of the following addendum:

	Dated _____
	Dated _____
	Dated _____

- C. Bidder agrees to perform all work described in the specifications and shown on the drawings, for the following lump sum price of:

1. Total Proposed Base Bid Contract Price:

\_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

the form of \_\_\_\_\_ is submitted herewith in  
accordance with the INSTRUCTION FOR BIDDERS and is to become property of the Owner in

the event the Contract and bonds are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

2. Alternates

This bid includes Alternates as follows:

ADD Alternate No. 1: \_\_\_\_\_dollars  
and \_\_\_\_\_cents \$ { \_\_\_\_\_ }.

ADD Alternate No. 2: \_\_\_\_\_dollars  
and \_\_\_\_\_cents \$ { \_\_\_\_\_ }.

- D. If the Bid is accepted by the Owner, the undersigned agrees to complete the entire work provided to be done under the contract within the time stipulated by the Owner.
- E. The undersigned agrees that for extra work, if any, performed in accordance with the AGREEMENT, he will accept compensation as stipulated therein in full payment for such extra work.
- F. Bidder understands that the Owner reserves the right to reject any and all bids.
- G. The undersigned hereby agrees that he will not withdraw the Bid within sixty (60) consecutive calendar days after the actual date of the opening of Bids and that, if the Owner accepts this Bid, the undersigned will duly execute and acknowledge the required Contract Bonds within 10 days after notification that the AGREEMENT is ready for signature.
- H. Should the undersigned fail to fulfill any of his agreements as here in before set forth, the Owner shall have the right to retain as liquidated damages the amount of the Bid security, which shall become the Owner/s property. If a bid was furnished as bid security, it is agreed that the amount thereof shall be paid as liquidated damages to the Owner by the Surety.
- I. The Undersigned certifies under penalty of perjury that this Bid is in all respect bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the "person" shall men natural person, joint venture, partnership, corporation or other business or legal entity.
- J. The undersigned certifies that he is able to furnish labor that can work in harmony with all with all laws and regulations applicable to awards made subject forty-four A.

1. Have been in business under the present name for\_\_\_\_years.
2. Ever failed to complete any work awarded?\_\_\_\_\_(Yes),\_\_\_\_\_(No). If yes, explain: \_\_\_\_\_
3. Bank Reference: \_\_\_\_\_

- K. The Bidder is required to state below all work he/she and his/her subcontractors (if subcontractors are to perform substantial portions of the work) has compete within the past 5 years of a similar character and value to that of the work included in the proposed Contract and to give references that will enable the Owners to judge the Bidder's experience, skill and business standing. The Bidder is required to list a minimum of 3 completed projects that are comparable in scope, complexity and value. For each project, include the name, location, type, date complete, construction value and owner contact. Please also fill out Section P below providing additional project information.

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(add supplementary page if necessary)

- L. The Bidder is required to state below all construction projects he/she currently has under contract. For each project, include the name, location, type, scheduled completion date, construction value and owner contact.

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- M. The undersigned bidder hereby certifies that the tools and equipment required to meet the specified requirements of the Contract document, with special attention called to Section 01 14 00 Special Provision and they meet the requirements to bid this specialized work.
- N. The undersigned further certifies under the penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth of Massachusetts under the provisions of section 29F, or any other applicable debarment

provisions of any other chapter of the General Laws or any rule or regulation declared there under.

- O. The undersigned bidder hereby certifies he/she will comply with the minority workforce percentage ratio and specific affirmative action steps contained in the EEO/AA provisions of the Contract, including compliance with Minority/Women Business Enterprise as required under these contract provisions. The contractor receiving the award of the Contract shall be required to obtain from each of its subcontractors a copy of its bidder's certification and submit it to the contracting agency prior to the award of such subcontract, regardless of tier, that it will comply with the minority workforce ratio and specific affirmative action steps contained in these EEO/AA contract provisions.
- P. Contractor shall list three successfully completed projects, which were historical in nature and containing the same type of work as the above mentioned project and can demonstrate they successfully meet all the requirements that have been set forth in 01 14 00 Special Provisions.

Project #1:

Project: \_\_\_\_\_

Value: \_\_\_\_\_

Contact: \_\_\_\_\_

Description of Project:

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Project #2:

Project: \_\_\_\_\_

Value: \_\_\_\_\_

Contact: \_\_\_\_\_

Description of Project:

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Project #3:

Project: \_\_\_\_\_

Value: \_\_\_\_\_

Contact: \_\_\_\_\_

Description of Project:

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Compliance Statement:

The significance of this project has been previously defined in the State and/ or National Registry of Historic Places. The integrity is defined in the U.S Department of the Interior's Secretary of the Interior's Standards for the Treatment of Historic Properties and the Guidelines for the Treatment of Cultural Landscapes as, "the authenticity of a property historic identity, evinced by the survival of physical characteristics that existed during the property's history period. The seven qualities of integrity as defined by the National Register Program are location, setting, feeling, association, design, workmanship, and materials".

The contractor submitting this bid, herein shall uphold all requirements and standards set for the by U.S. Department of the Interior's Secretary of the Interiors Standards.

Date: \_\_\_\_\_

\_\_\_\_\_  
Name of General Bidder

By:

\_\_\_\_\_  
Name and Title of Person Signing Bond

\_\_\_\_\_  
Business Address

## **FORM A**

### **CERTIFICATE OF NON-COLLUSION**

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this section the word 'person' shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

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Authorized Name

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Authorized Signature

Date

---

Social Security Number or Federal Identification Number

---

Legal Name of Business Entity (Print or

---

Type) Address

---

City, State, Zip Code

Corporate Seal (If applicable)



**FORM B**

**CERTIFICATE OF FOREIGN CORPORATION**

The undersigned certifies that it has been duly established, organized, or chartered as a corporation under the laws of:

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Jurisdiction

The undersigned further certifies that it complies with the requirements of M.G.L, c. 30, sec. 39L and with the requirements of M.G.L, c. 181 relative to the registration and operation of foreign corporations within the Commonwealth of Massachusetts.

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Name of Person Signing the Bid or Proposal

Date

---

Signature of Person Signing the Bid or Proposal

Date

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Name of Business (Print or Type)

Corporate Seal (If applicable)

**FORM C**

## COMMONWEALTH OF MASSACHUSETTS

## SCHEDULE FOR PARTICIPATION BY WOMEN/MINORITY BUSINESS

## ENTERPRISE BIDDER CERTIFICATION

A bidder agrees to expend at least the amount of the contract set forth below if awarded, for W/MNE. For the purposes of this commitment, the designation means a business that has been certified by SOMWBA as such. The Bidder must indicate the W/MBE it intends to utilize in this document as follows: (Attach another sheet of necessary.)

Company Name and Address	Nature of Participant	Dollar Value of Participation
--------------------------	-----------------------	-------------------------------

1.		\$ _____
2.		\$ _____
3.		\$ _____

The undersigned hereby certifies that he or she read the terms of this condition and is authorized to bind the Bidder to the commitment herein set forth.

\_\_\_\_\_  
Name of Person Signing the Bid or Proposal

_____ Signature of Person Signing the Bid or Proposal	_____ Title
----------------------------------------------------------	----------------

\_\_\_\_\_  
Name of Business (Print or Type)

Corporate Seal (If applicable)

## **FORM D**

### **BIDDER CERTIFICATION REGARDING PAYMENT OF PREVAILING WAGES**

The undersigned hereby certifies, under pains and penalties of perjury, that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less than the applicable wage rates established for the project by the Massachusetts Department of Labor and Industries. The undersigned bidder agrees to identify the awarding authority for, from, and against any loss, expense, damages, action, or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result of (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wage rates or (2) the failure of the bidder, if selected as the contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

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Date

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Name of Person Signing the Bid or Proposal

---

Signature of Person Signing the Bid or Proposal Title

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Name of Business (Print or Type)

Corporate Seal (If applicable)

## **FORM E**

### **CERTIFICATION OF PAYMENT OF STATE TAXES**

Legislation enacted by the Commonwealth of Massachusetts, effective, 1983, requires that attestation below be signed:

Pursuant top M.G.L c. 62C, sec. 49A, I certify under the penalties of perjury, that I,to my best knowledge and belief, have filed all state tax returns and paid all state taxes required by law.

**APPROVAL OF A CONTRACT OR ANY OTHER AGREEMENT WILL NOT BE GRANTED UNLESS THIS CERITIFCATION CLAUSE IS SIGNED BY AN AUTHORIZED CORPROATE OFFICER.**

**THE TAX PAYER IDENTIFICATION NUMBER WILL BE FURNISHED TO THE MASSACHUSETIS DPEARTMENT OF REVENUE TO DETERMINE IF TAX FILINGS AND/OR TAX PAYMENT OBLIGATIONS HAVE BEEN MET. PROVIDERS WHO FAIL TO CORRECT THIER NON-FILING AND/OR DELIQUENCY STATUS SHALL NOT HAVE A CONTRACT OR ANY OTHER AGREEMENT ISSUED, RENEWED OR EXTENDED**

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(Signature of Individual)

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Title

---

Social Security Number or Federal Identification Number

---

Corporate Name

---

Name of Person Signing the Proposal (Print or Type)

---

Date

---

Legal Name of Business Entity (Print or

---

Type) Business Address

Corporate Seal (If applicable)

**FORM F**

**CERTIFICATION OF AUTHORITY MEETING OF BOARD OF DIRECTORS**

(Note: if business entity is a partnership or individual, all owners shall sign this form.)

At a meeting of the Directors of the \_\_\_\_\_ duly called  
and held at

(Corporation  
)

\_\_\_\_\_ on the \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_\_,  
(Location)

at which a quorum was present and acting, it was voted that \_\_\_\_\_, the  
(Name)

\_\_\_\_\_ of this Corporation, is hereby authorized and empowered to  
make, (Title/Position)

into, sign, seal and deliver on behalf of the Corporation a Contract for \_\_\_\_\_

with the \_\_\_\_\_, and the performance and  
payment bonds each in the amount as specified by the Owner.

I hereby certify that the above is a true and correct copy of the record, that said vote  
has not been amended or repealed and is in full force, and effect as of this date and  
that

\_\_\_\_\_ is duly elected \_\_\_\_\_ of the corporation  
(Name) (Title/Position)

\_\_\_\_\_  
Clerk or secretary of the Corporation

\_\_\_\_\_  
Date

(Note: If the Bidder is a corporation, affix corporate seal and give below the names of its  
president, treasurer, and general manager, if any: if a partnership, give full names and  
residential addresses of all partners; and if an individual, give residential address if different  
from business address.)

the required names and addresses of all person interested in this proposal, as  
Principals, are as follows:

\_\_\_\_\_

## **CONTRACT FOR MENOTOMY FOUNTAIN REHABILITATION AGREEMENT**

THIS AGREEMENT, made as of this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between the TOWN OF ARLINGTON, MASSACHUSETTS, acting through its TOWN

MANAGER, hereinafter called the 'Owner' and \_\_\_\_\_,,  
of \_\_\_\_\_ (Name of Contractor)  
country of \_\_\_\_\_ and  
State of \_\_\_\_\_, hereinafter called the 'Contractor'.

WITNESSETH; That the Contractor and the Owner for the consideration hereinafter named agrees as follow:

1. SCOPE: The Contractor will furnish at his own proper cost and expense all materials, supplies, machinery, equipment, appliances, tools, superintendence, labor, insurance and other items and services necessary to complete the work as shown and described on the Contract Documents entitled "Menotomy Fountain Rehabilitation", Arlington, Massachusetts, hereinafter called the 'Project', prepared by Weston & Sampson, Inc. hereinafter called the 'Designer', or 'Engineer'.
2. CONTRACT SUM: The owner agrees to pay the contractor, and the contractor agrees to accept in full consideration for the performance of the contract, subject to additions and deductions provided for in the contract documents, in current funds, the sum of dollars (\$ \_\_\_\_\_), hereinafter called the 'Contract Sum' and to make payments on account thereof, as described below and elsewhere in the Contract Documents.
3. COMMENCEMENT OF WORK AND TIME OF COMPLETION: The contractor agrees to commence work on the contract within seven (7) calendar days from the receipt of written Notice to Proceed issued by the Owner and/or within fourteen (14) calendar days after execution of the contract Agreement and to thereafter diligently and continuously carry on the work. He agrees to complete the work on or before the end of the 150 Calendar days, except as herein noted.
4. LIQUIDATED DAMAGES: The Contractor agrees to pay the Owner liquidated damages for failure to complete the Project in conformance with the time allowances as set forth above at the rate of \$500.00 per calendar day.
5. ALTERNATES: The following Alternates have been accepted and the Contract Sum stated in Paragraph 2 of this Agreement includes and is adjusted to reflect the total cost of each accepted alternate:

Alternate No.	Indicate Accepted or Rejected	Original Bid Value of Alternate
ADD Alt. No. 1	_____	_____
ADD Alt. No. 2	_____	_____
ADD Alt. No. 3	_____	_____

6. PAYMENTS TO CONTRACTOR: Payments shall be made in accordance with Chapter 30, Section 39K of the General Laws of the Commonwealth of Massachusetts, including all current amendments, generally as follows:

- A. Within fifteen days after receipt from the Contractor, at the place designated by the Owner if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the Owner will make a periodic payment to the Contractor for the work performed during the preceding month and for the - materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the Contractor has title or to which a subcontractor has title and has authorized the Contractor to transfer title to the Owner, less (1) a retention based on its estimate of the fair value of its claims against the Contractor and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of Section 39F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the Contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the Owner, less than one percent of the original contract price, or (b) the Contractor substantially completes the work and the Owner takes possession for occupancy, whichever occurs first, the Owner shall pay the Contractor the entire balance due on the Contract less (1) a retention based on its estimate of the fair value of its claim against the Contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on the demands for same in accordance with the provisions of Section 39F, or based on the record of payments by the Contractor to the subcontractors under this contract if such record of payment indicates that the Contractor has not paid subcontractors as provided in Section 39F. If the Owner fails to make payment as herein provided, there shall be added to each such payment daily interest at the rate of five percent per annum commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the Contractor, provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for Final Payment until fifteen days after receipt of such a periodic estimate from the Contractor, at the place designated by the Owner if such a place is so designated. The Contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

- B. The Owner may make changes in any periodic estimate submitted by the
- CONTRACT FORM

Contractor and the payment due on said periodic estimate shall be computed in accordance with the changes so made, but such changes or any requirement for a corrected periodic estimate shall not affect the due date for the periodic



payment or the date for the commencement of interest charges on the amount of the periodic payment computed in accordance with the changes made, as provided herein; provided that the Owner may, within seven days after receipt, return to the Contractor for correction any periodic estimate which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt for such periodic estimate in proper form and with arithmetically correct computations. The date of receipt of a periodic estimate received on a Saturday shall be the first working day thereafter. The provisions of Section 39G shall not apply to any contract for the construction, reconstruction, remodeling, repair or demolition of any public building to which this section applies.

7. PAYMENTS TO SUBCONTRACTORS: Payments shall be made in accordance with Chapter 30, Section 39F of the General Laws of the Commonwealth of Massachusetts, including all current amendments, generally as follows:

- A. Forthwith after the General Contractor receives payment on account of a period estimate, the General Contractor shall pay to each Subcontractor the amount paid for the labor performed and the materials furnished in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the General Contractor.
- B. Not later than the sixty-fifth day after each Subcontractor substantially completes his work in accordance with the plans and specifications, the entire balance due under the Subcontract less amounts retained by the Owner as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the Subcontractor, and the Owner shall pay that amount to the General Contractor. The General Contractor shall forthwith pay to the Subcontractor the full amount received from the Owner less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the General Contractor.
- C. Each payment made by the Owner to the General Contractor pursuant to subparagraphs (A) and (B) of this paragraph for the labor performed and the materials furnished by a Subcontractor shall be made to the General Contractor for the account of that Subcontractor: and the Owner shall take reasonable steps to compel the General Contractor to make each payment to each such Subcontractor. If the Owner has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the General Contractor for payment to the Subcontractor as provided in subparagraphs (A) and (B), the Owner shall act upon demand as provided in this Section.
- D. If, within seventy days after the Subcontractor has substantially completed the Subcontract work, the Subcontractor has not received from the General Contractor the balance due under the Subcontract including any amount due for extra labor and materials furnished to the General Contractor, less any

amount retained by the Owner as the estimated cost of completing the incomplete and unsatisfactory items of work, the Subcontractor may demand direct payment of that balance from the Owner. The demand shall be by a sworn statement delivered to or sent by certified mail to the Owner, and a copy shall be delivered to or sent by certified mail to the General Contractor at the same time. The demand shall contain a detailed breakdown of the balance due under the Subcontract and also a statement of the status of completion of the Subcontract work. Any demand made after Substantial Completion of the Subcontract work shall be valid even if delivered or mailed prior to the seventieth day after the Subcontractor has substantially completed the Subcontract work. Within ten days after the Subcontractor has delivered or so mailed the demand to the Owner and delivered or so mailed a copy to the General Contractor, the General Contractor may reply to the demand. The reply shall be a sworn statement delivered to or sent by certified mail to the Owner and a copy shall be delivered to or sent by certified mail to the Subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the Subcontract including any amount due for extra labor and materials furnished to the General Contractor and of the amount due for each claim made by the General Contractor against the Subcontractor.

- E. Within fifteen days after receipt of the demand by the Owner, but in no event prior to the seventieth day after Substantial Completion of the Subcontract work, the Awarding Authority shall make direct payment to the Subcontractor of the balance due under the Subcontract, less any amount (i) retained by the Owner as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the General Contractor in the sworn reply: provided, that the Owner shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required in subparagraph (D); The Owner shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.
- F. The Owner shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (E) in an interest-bearing joint account in the names of the General Contractor and the Subcontractor in a bank in Massachusetts; selected by the Owner and agreed upon by the General Contractor and the Subcontractor and shall notify the General Contractor and the Subcontractor of the date of deposit and the bank receiving the deposit. The bank shall pay the amount on the account, including accrued interest, as provided in an agreement between the General Contractor and the Subcontractor or as determined by decree of a court of competent jurisdiction.
- G. All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (F) shall be made out of amounts payable to the General

Contractor at the time of receipt of a demand for direct payment from a Subcontractor and out of amounts later become payable to the General Contractor and in order of receipt of such demands from Subcontractors. All direct payments shall discharge the obligation of the Owner to the General Contractor to the extent of such payment.

- H. The Owner shall deduct from payments to a General Contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (F), are sufficient to satisfy all unpaid balances of demands for direct payment received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the General Contractor.
- I. On all contracts for building construction subject to the provisions of Sections 44A to 44L, inclusive, of Chapter 149, periodic payments for work performed by a Subcontractor shall be made to the General Contractor for payment to the Subcontractor and shall be paid to the Subcontractor forthwith after receipt thereof by the General Contractor and without any ten day waiting period as provided above, less any amount claimed by the General Contractor in a letter containing a breakdown of the claim and sent to the Subcontractor with such payment, provided that a General Contractor, who has received a periodic estimate for a periodic payment in proper form from a Subcontractor three days, Saturdays, Sundays and holidays excluded, before the due date of the General Contractor's periodic estimate for the same periodic payment period less any amount claimed by the General Contractor in a letter containing a breakdown of the claim and sent to the Subcontractor with such payment, even though the General Contractor does not submit a periodic estimate to the Owner for that payment period; and provided, further, that the Owner shall take all reasonable steps to compel the General Contractor to make payment to the Subcontractors as provided in this paragraph, and upon the written request of a Subcontractor setting forth the amount payable but not paid, a copy of which shall be sent to the General Contractor, shall make direct payment to a Subcontractor, as provided for above, which shall discharge the obligation of the Owner to the General Contractor to extent of any such payment.
- J. The Owner shall not include in any direct payment to a Subcontractor pursuant to this section any amount claimed from that Subcontractor by the General Contractor in a letter containing a breakdown of the claim and sent to the Owner within ten days after the receipt by the General Contractor of the copy of the request of the Subcontractor to the Owner for direct payment.

## 8. CONDITIONS OF EMPLOYMENT

- A. The schedule of Minimum Wage Rates and Health and Pension Fund Contributions as determined by the Commissioner under the provisions

of the Massachusetts General Laws, Chapter 149, Sections 26 m 27D, inclusive, AS amended, is hereby made a part of this Agreement.

- B. The Contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wages paid to regular police officers in such city or town.
- C. No laborer, workman, mechanic, foreman or inspector working within the Commonwealth, in the employ of the Contractor, Subcontractor or any other person doing or contracting to do the whole or a part of the work contemplated by the Contract, shall be required or permitted to work more than eight hours in any one day or forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency.
- D. Every employee of the Contractor or any Subcontractor shall lodge, board and trade where and with whom he elects; and no person or his agents or employees shall be directly or indirectly required, as a condition of employment that the employee to lodge, board or trade at a particular place or with a particular person.

9. SUBCONTRACTORS

- A. The Contractor will employ the following Subcontractors on the work and will pay for the execution of his as defined in the Contract Documents; and subject to the additions and deductions provided in the subject to the additions and deductions provided in the Contract Documents, the sum shown opposite his name.

<u>Class Of Work</u>	<u>Subcontractor</u>	<u>Subcontractor Sum</u>

- B. The names of any additional Subcontractors whom the Contractor proposed to employ shall be submitted to the Designer for approval. No such Subcontractor shall be employed to whose standing or ability the Owner or the Designer has any reasonable objection.
- 10. THE CONTRACT DOCUMENTS: The General Conditions of the Contract, the Specifications and the Drawings, together with this Agreement, for the Contract, and they are as fully a part of the Contract as if hereto attached or herein repeated Drawings and Specifications titled: Menotomy Fountain Rehabilitation
- 11. INCORPORATION OF STATUTES BY REFERENCE: If statutes of the Commonwealth of Massachusetts in any way relating to the construction, alterations, repair and installation of public works, particularly with reference to labor and labor rates, they shall be strictly complied with by the Contractor and it is understood that all such statutes are incorporated by reference in this Contract.

12. It is expressly agreed that this Agreement is to be executed for and in behalf of the Owner by the members of its Board of Selectmen and any of its appoints and that such persons are acting in a representative capacity for and in behalf of Owner, and that such persons shall not incur any personal liability hereunder.

IN WITNESS whereof, inhabitants of the Town of Arlington and

\_\_\_\_\_

have caused these presents to be executed by their

\_\_\_\_\_

hereunto duly authorized the day and year first written.

TOWN OF ARLINGTON

\_\_\_\_\_

Adam W. Chapdelaine, Town Manager

Certification:

I hereby Certify that an  
appropriation in the amount  
of the Contract is available.

\_\_\_\_\_

Town Accountant

\_\_\_\_\_

Contractor

By: \_\_\_\_\_(Title)

Approved as to Matter of Form:

\_\_\_\_\_

Town Counsel

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## PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we

---

(Name of Contractor)

a \_\_\_\_\_  
(Corporation, Partnership or Individual)

hereinafter called "Principal" and

---

(Surety)  
of \_\_\_\_\_, State of \_\_\_\_\_, hereinafter called the  
"Surety", are held and firmly bound into

THE TOWN OF ARLINGTON, MASSACHUSETTS  
(Owner)

acting through its TOWN MANAGER

ARLINGTON, MASSACHUSETTS  
(City and State)

hereinafter called "Owner", in the penal sum of  
\_\_\_\_\_ Dollars (\$\_\_\_\_\_) in lawful  
money of the United states, for the payment of which sum well and truly to be made,  
we bind ourselves, our heirs, executors, administrators and successors, jointly and  
severally, firmly  
by these presents.

THE CONDITION OF THIS OBLIGATION is such that Whereas, the Principal  
entered into a certain contract with the Owner, dated \_\_\_\_\_ day of  
a copy of which is hereto attached and made a part hereof for the construction of

---

Arlington, Massachusetts

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its  
duties, all the undertakings, covenants, terms, conditions, and agreements of said  
contract during the original term thereof, and any extensions thereof which may be  
granted by, the Owner, with or without notice to the Surety, and if he shall satisfy all  
claims and demands incurred under such contract, and shall fully indemnify and save  
harmless the Owner from all costs and damages which it may suffer by reason of  
failure to do so, and shall reimburse and repay



the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder or the specifications accompanying the same

shall in any way affect its obligation of this, Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall 'abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

INWITNESS WHEREOF, the parties to these present have duly executed in this Bond on the day of\_\_\_\_\_

ATTEST:

\_\_\_\_\_  
Principal

By\_\_\_\_\_  
Secretary

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
(Address - zip code)

\_\_\_\_\_  
Witness as to Principal

(Seal)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
(Address - zip code)

ATTEST:

\_\_\_\_\_  
Surety

BY \_\_\_\_\_  
(Surety)

\_\_\_\_\_  
Secretary

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(Address-Zip Code)

\_\_\_\_\_  
Witness as to Surety

(Seal)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF DOCUMENT

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## LABOR AND MATERIALS PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we

\_\_\_\_\_  
(Name of Contractor)

a \_\_\_\_\_  
(Corporation, Partnership or Individual)  
hereinafter called "Principal" and

\_\_\_\_\_  
(Surety)

of \_\_\_\_\_, State of \_\_\_\_\_, hereinafter called the  
"Surety", are held and firmly bound into

TOWN OF ARLINGTON, MASSACHUSETTS

(Owner)

acting through its TOWN MANAGER

ARLINGTON, MASSACHUSETTS

(City and State)

herein called "Owner", in the penal sum of

\_\_\_\_\_, Dollars (\$) in  
lawful money of the United States, for the payment of which sum well and truly to be  
made, we bind ourselves, our heirs, executors, administrators and successors, jointly  
and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that 'Whereas, the Principal  
entered into a certain contract with the Owner, dated the day of \_\_\_\_\_ ,  
a copy of which is hereto attached and made a part hereof for the construction of:

MENOTOMY FOUNTAIN REHABILITATION IN ARLINGTON  
MASSACHUSETTS

NOW, THEREFORE, if the Principal shall promptly make payment to all persons,  
firms, subcontractors, and corporations furnishing materials for or performing labor  
in the prosecution of the work provided for in such contract, and any authorized  
extension or modification thereof, including all amounts due for materials, lubricants,  
oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or

LABOR AND MATERIALS PAYMENT BOND

used in connection with the construction of such work, and all insurance premiums on said work, and for all labor, performed in such work whether by subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the Same shall in any wise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, the parties to these present have duly executed in this Bond on the day of \_\_\_\_\_,

ATTEST:

\_\_\_\_\_  
Principal

BY  
Secretary

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(Address - zip code)

\_\_\_\_\_  
Witness as to Principal

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_  
(Address - zip code)

(Seal)

ATTEST:

\_\_\_\_\_

Surety

\_\_\_\_\_

Secretary

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Address-Zip Code)

\_\_\_\_\_

Witness as to Surety

(Seal)

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Address-Zip Code)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

END OF DOCUMENT

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# STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

**ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE**

and

Issued and Published Jointly By

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AMERICAN

SOCIETY OF CIVIL ENGINEERS

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Construction Specifications Institute



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National Society of Professional Engineers  
1420 King Street, Alexandria, VA 22314

American Consulting Engineers Council  
1015 15th Street N.W., Washington, DC 20005

American Society of Civil Engineers  
345 East 47th Street, New York, NY 10017

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## GENERAL CONDITIONS

### ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

---

#### 1.01 *Defined Terms*

A. Wherever used in the Contract Documents and printed with initial or all capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *Agreement*--The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work.

3. *Application for Payment*--The form acceptable to ENGINEER which is to be used by CONTRACTOR during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*--The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

7. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

8. *Bonds*--Performance and payment bonds and other instruments of security.

9. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the

Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*--A demand or assertion by OWNER or CONTRACTOR seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*--The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work Change Directives, Field Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

13. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

15. *CONTRACTOR*--The individual or entity with whom OWNER has entered into the Agreement.

16. *Cost of the Work*--See paragraph 11.01.A for definition.

17. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*--The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *ENGINEER*--The individual or entity named as such in the Agreement.

20. *ENGINEER's Consultant*--An individual or entity having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

21. *Field Order*--A written order issued by ENGINEER which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

22. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

23. *Hazardous Environmental Condition*--The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

24. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

25. *Laws and Regulations; Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*--Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

27. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

28. *Notice of Award*--The written notice by OWNER to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement.

29. *Notice to Proceed*--A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents.

30. *OWNER*--The individual, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

31. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

32. *PCBs*--Polychlorinated biphenyls.

33. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

34. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

35. *Project Manual*--The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

36. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

37. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.

38. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

39. *Shop Drawings*--All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

40. *Site*--Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR.

41. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

42. *Subcontractor*--An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.

43. *Substantial Completion*--The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

44. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

45. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

46. *Underground Facilities*--All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

47. *Unit Price Work*--Work to be paid for on the basis of unit prices.

48. *Work*--The entire completed construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

49. *Work Change Directive*--A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

50. *Written Amendment*--A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

## 1.02 Terminology

### A. Intent of Certain Terms or Adjectives

1. Whenever in the Contract Documents the terms “as allowed,” “as approved,” or terms of like effect or import are used, or the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

### B. Day

1. The word “day” shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

### C. Defective

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.04 or 14.05).

### D. Furnish, Install, Perform, Provide

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other

specified location) ready for use or installation and in usable or operable condition.

2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, “provide” is implied.

E. Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

## ARTICLE 2 - PRELIMINARY MATTERS

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### 2.01 Delivery of Bonds

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish.

### 2.02\* Copies of Documents

A. OWNER shall furnish to CONTRACTOR up to ten copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

### 2.03 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times com-



mence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

#### 2.04 *Starting the Work*

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

\*See Supplementary Conditions

#### 2.05\* *Before Starting Construction*

A. *CONTRACTOR's Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.

B. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and
3. a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into

component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

\* C. *Evidence of Insurance:* Before any Work at the Site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

#### 2.06 *Preconstruction Conference*

A. Within 20 days after the Contract Times start to run, but before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

#### 2.07 *Initial Acceptance of Schedules*

A. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.05.B. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until acceptable schedules are submitted to ENGINEER.

1. The progress schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on ENGINEER responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

2. CONTRACTOR's schedule of Shop Drawing and Sample submittals will be acceptable to ENGINEER if it provides a workable arrangement for reviewing and processing the required submittals.

3. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

\*See Supplementary Conditions

### ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

#### 3.01\* *Intent*

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to OWNER.

C. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.

#### 3.02 *Reference Standards*

##### A. *Standards, Specifications, Codes, Laws, and Regulations*

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's Consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

#### 3.03 *Reporting and Resolving Discrepancies*

##### A. *Reporting Discrepancies*

1. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier, CONTRACTOR shall report it to ENGINEER in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

##### B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

#### 3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or

\*See Supplementary Conditions

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways: (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

#### 3.05 *Reuse of Documents*

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

### ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

#### 4.01 *Availability of Lands*

A. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or

restrictions not of general application but specifically related to use of the Site with which CONTRACTOR must comply in performing the Work. OWNER will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If CONTRACTOR and OWNER are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

B. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

#### 4.02\* *Subsurface and Physical Conditions*

A.\* *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Contract Documents; and
2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER, or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, includ-

ing, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

\*See Supplementary Conditions

#### 4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *ENGINEER's Review:* After receipt of written notice as required by paragraph 4.03.A, ENGINEER will promptly review the pertinent condition, determine the

necessity of OWNER's obtaining additional exploration or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

#### C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.08 and 11.03.

2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

c. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.03.A.

3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be

made therefor as provided in paragraph 10.05. However, OWNER, ENGINEER, and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

#### 4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities, including OWNER, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

2. the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:

- a. reviewing and checking all such information and data,

- b. locating all Underground Facilities shown or indicated in the Contract Documents,

- c. coordination of the Work with the owners of such Underground Facilities, including OWNER, during construction, and

- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or

performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.

2. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price of Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, OWNER or CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

#### 4.05\* *Reference Points*

A. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

#### 4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto; or

\*See Supplementary Conditions

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately: (i) secure or otherwise isolate such condition;

(ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall not be required to resume Work in connection with such condition or in any affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, either party may make a Claim therefor as provided in paragraph 10.05.

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or

Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.E shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.F shall obligate CONTRACTOR to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

\*See Supplementary Conditions

## ARTICLE 5 - BONDS AND INSURANCE

### 5.01\* *Performance, Payment, and Other Bonds*

A. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Contract Documents.

B.\* All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Compa-

nies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.01.B, CONTRACTOR shall within 20 days thereafter substitute another Bond and surety, both of which shall comply with the requirements of paragraphs 5.01.B and 5.02.

### 5.02 *Licensed Sureties and Insurers*

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

### 5.03 *Certificates of Insurance*

A. CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain.

### 5.04\* *CONTRACTOR's Liability Insurance*

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to

perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;
3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;
4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by this paragraph 5.04 to be purchased and maintained shall:

\*See Supplementary Conditions

1. with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.07, 6.11, and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replacing defective Work in accordance with paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

#### 5.05 *OWNER's Liability Insurance*

A.\* In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.04, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

#### 5.06\* *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property



insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

\*See Supplementary Conditions

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER;

5. allow for partial utilization of the Work by OWNER;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with

30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

B.\* OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C.\* All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

D.\* OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraph 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E.\* If CONTRACTOR requests in writing that other special insurance be included in the property insurance policies provided under paragraph 5.06, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the Site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

#### 5.07 *Waiver of Rights*

A.\* OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and all other

individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused.

None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

B. OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for:

\*See Supplementary Conditions

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of, or resulting from fire or other peril whether or not insured by OWNER; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to

paragraph 14.05, after Substantial Completion pursuant to paragraph 14.04, or after final payment pursuant to paragraph 14.07.

C. Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against CONTRACTOR, Subcontractors, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them.

#### 5.08\* *Receipt and Application of Insurance Proceeds*

A.\* Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with OWNER and made payable to OWNER as fiduciary for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.08.B. OWNER shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B.\* OWNER as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to OWNER's exercise of this power. If such objection be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

#### 5.09\* *Acceptance of Bonds and Insurance; Option to Replace*

A.\* If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the

certificates (or other evidence requested) required by paragraph 2.05.C. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

#### 5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

### ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

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#### 6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with

\*See Supplementary Conditions

the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of

construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

#### 6.02 *Labor; Working Hours*

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the

Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday, or any legal holiday without OWNER's written consent (which will not be unreasonably withheld) given after prior written notice to ENGINEER.

#### 6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the General Requirements, CONTRACTOR shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly

run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

#### 6.04 *Progress Schedule*

A. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.07 as it may be adjusted from time to time as provided below.

1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.07) proposed adjustments in the progress schedule that will not result in changing the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

#### 6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.

1. *"Or-Equal" Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be

considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment ENGINEER determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

#### 2. *Substitute Items*

a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

c. The procedure for review by ENGINEER will be as set forth in paragraph 6.05.A.2.d, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify

that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.05.A.2.

C. *Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.05.A and 6.05.B. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a

substitute or an approved Shop Drawing for an "or equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

E. *ENGINEER's Cost Reimbursement:* ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05.A.2 and 6.05.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute.

F. *CONTRACTOR's Expense:* CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

#### 6.06 *Concerning Subcontractors, Suppliers, and Others*

A. CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to OWNER as indicated in paragraph 6.06.B), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified date prior to the Effective Date of the Agreement, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement

for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

C. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other individual or entity, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with ENGINEER through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRAC-

TOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

#### 6.07 *Patent Fees and Royalties*

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

#### 6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for

the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

#### 6.09 *Laws and Regulations*

A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

B. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Times. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in paragraph 10.05.

#### 6.10\* *Taxes*

A. CONTRACTOR shall pay all sales, consumer, use, and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

#### 6.11\* *Use of Site and Other Areas*

##### A.\* *Limitation on Use of Site and Other Areas*

1. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations,

\*See Supplementary Conditions

and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures*: CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

#### 6.12 *Record Documents*

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to ENGINEER for OWNER.

#### 6.13 *Safety and Protection*

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

#### 6.14 *Safety Representative*

A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

#### 6.15 *Hazard Communication Programs*

A. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

#### 6.16 *Emergencies*



A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, CONTRACTOR is obligated to act to prevent threatened damage, injury, or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued.

#### 6.17\* *Shop Drawings and Samples*

A.\* CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show ENGINEER the services, materials, and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.17.E.

B.\* CONTRACTOR shall also submit six (6) Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

#### D. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or

\*See Supplementary Conditions

Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

#### E. *ENGINEER's Review*

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals

will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. ENGINEER's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of each submittal as required by paragraph 6.17.D.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.17.D.1.

#### F. *Resubmittal Procedures*

1. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

#### 6.18 *Continuing the Work*

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.04 or as OWNER and CONTRACTOR may otherwise agree in writing.

#### 6.19 *CONTRACTOR's General Warranty and Guarantee*

A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or
2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by ENGINEER;
2. recommendation by ENGINEER or payment by OWNER of any progress or final payment;
3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;
4. use or occupancy of the Work or any part thereof by OWNER;
5. any acceptance by OWNER or any failure to do so;
6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;
7. any inspection, test, or approval by others; or
8. any correction of defective Work by OWNER.

## 6.20 Indemnification

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and

other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

## ARTICLE 7 - OTHER WORK

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### 7.01 *Related Work at Site*

A. OWNER may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and

2. if OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in paragraph 10.05.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of

such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in such other work.

#### 7.02 *Coordination*

A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility for such coordination.

### ARTICLE 8 - OWNER'S RESPONSIBILITIES

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#### 8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

#### 8.02 *Replacement of ENGINEER*

A. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer to whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

#### 8.03 *Furnish Data*

A. OWNER shall promptly furnish the data required of OWNER under the Contract Documents.

#### 8.04 *Pay Promptly When Due*

A. OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.02.C and 14.07.C.

#### 8.05 *Lands and Easements; Reports and Tests*

A. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05. Paragraph 4.02 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by ENGINEER in preparing the Contract Documents.

\*See Supplementary Conditions

#### 8.06\* *Insurance*

A.\* OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

#### 8.07 *Change Orders*

A. OWNER is obligated to execute Change Orders as indicated in paragraph 10.03.

#### 8.08 *Inspections, Tests, and Approvals*

A. OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.03.B.

#### 8.09 *Limitations on OWNER's Responsibilities*

A. The OWNER shall not supervise, direct, or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

#### 8.10 *Undisclosed Hazardous Environmental Condition*

A. OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.06.

#### 8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

### ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

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#### 9.01 *OWNER'S Representative*

A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and will not be changed without written consent of OWNER and ENGINEER.

#### 9.02 *Visits to Site*

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and

observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

B. ENGINEER's visits and observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.10, and particularly, but without limitation, during or as a result of ENGINEER's visits or observations of CONTRACTOR's Work. ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work.

#### 9.03\* *Project Representative*

A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more extensive observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.10 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the Site who is not ENGINEER's Consultant, agent or employee,

\*See Supplementary Conditions

the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

#### 9.04 *Clarifications and Interpretations*

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents.

ments. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

#### 9.05 *Authorized Variations in Work*

A. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR, who shall perform the Work involved promptly. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

#### 9.06 *Rejecting Defective Work*

A. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

#### 9.07 *Shop Drawings, Change Orders and Payments*

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

B. In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

#### 9.08 *Determinations for Unit Price Work*

A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding (except as modified by ENGINEER to reflect changed factual conditions or more accurate data) upon OWNER and CONTRACTOR, subject to the provisions of paragraph 10.05.

#### 9.09 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

\*See Supplementary Conditions

#### 9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such

authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform the Work in accordance with the Contract Documents.

C. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this paragraph 9.10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants. See Article 18.

## ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

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### 10.01 *Authorized Changes in the Work*

A. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the

applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in paragraph 10.05.

### 10.02 *Unauthorized Changes in the Work*

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in paragraph 3.04, except in the case of an emergency as provided in paragraph 6.16 or in the case of uncovering Work as provided in paragraph 13.04.B.

### 10.03 *Execution of Change Orders*

A. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

1. changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.01.A, (ii) required because of acceptance of defective Work under paragraph 13.08.A or OWNER's correction of defective Work under paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.18.A.

#### 10.04 *Notification to Surety*

A. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility. The amount of each applicable Bond will be adjusted to reflect the effect of any such change.

#### 10.05 *Claims and Disputes*

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the ENGINEER and the other party to the Contract within 60 days after the start of such event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to ENGINEER and the claimant within 30 days after receipt of the claimant's last submittal (unless ENGINEER allows additional time).

B. *ENGINEER's Decision:* ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16; or
2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days

after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05.

#### ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

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##### 11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work



shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, with the advice of ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of

CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the changes in the Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, the costs of premiums for all Bonds and insurance CONTRACTOR is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.01.A.1 or specifically covered by paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not

limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 11.01.A and 11.01.B.

C. *CONTRACTOR's Fee:* When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to paragraphs 11.01.A and 11.01.B, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

#### 11.02 *Cash Allowances*

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of

Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER subject to the provisions of paragraph 9.08.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
2. there is no corresponding adjustment with respect any other item of Work; and
3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE;  
CHANGE OF CONTRACT TIMES

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12.01\* *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B.\* The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.03 ); or
2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.01.C.2); or
3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 12.01.C).

C. *CONTRACTOR's Fee:* The CONTRACTOR's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
  - a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent;

b. for costs incurred under paragraph 11.01.A.3, the CONTRACTOR's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

\*See Supplementary Conditions

d. no fee shall be payable on the basis of costs itemized under paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

#### 12.02 *Change of Contract Times*

A. The Contract Times (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. Any adjustment of the Contract Times (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones)

will be determined in accordance with the provisions of this Article 12.

#### 12.03 *Delays Beyond CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in paragraph 12.02.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

#### 12.04 *Delays Within CONTRACTOR's Control*

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

#### 12.05 *Delays Beyond OWNER's and CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

#### 12.06 *Delay Damages*

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR; or

2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility

owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

#### ARTICLE 13 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

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##### 13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

##### 13.02\* *Access to Work*

A. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

##### 13.03\* *Tests and Inspections*

A. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B.\* OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04.B shall be paid as provided in said paragraph 13.04.B; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection or approval.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to OWNER and ENGINEER.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

F. Uncovering Work as provided in paragraph 13.03.E shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

##### 13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in

question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

\*See Supplementary Conditions

#### 13.05 *OWNER May Stop the Work*

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

#### 13.06 *Correction or Removal of Defective Work*

A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

#### 13.07 *Correction Period*

A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by OWNER or permitted by Laws and Regulations as contemplated in paragraph 6.11.A is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not defective, and (iii) satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or repaired or may have the rejected Work removed and replaced, and all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

#### 13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

#### 13.09 *OWNER May Correct Defective Work*

A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06.A, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days written notice

to CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this paragraph 13.09 will be charged against CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, OWNER may make a Claim therefor as provided in paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies under this paragraph 13.09.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

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14.01 *Schedule of Values*

A. The schedule of values established as provided in paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A.\* *Applications for Payments*

1. At least 20 days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect OWNER's interest therein, all of which must be satisfactory to OWNER.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied on account to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to pro-gress payments will be as stipulated in the Agreement.

\*See Supplementary Conditions

B. *Review of Applications*

1. ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

2. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's observations on the Site of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

3. By recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents; or (ii) that there may not be other matters or issues between the parties



that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

4. Neither ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any Liens.

5. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.02.B.2. ENGINEER may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

- a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
- b. the Contract Price has been reduced by Written Amendment or Change Orders;
- c. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or
- d. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

#### *C. Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by OWNER to CONTRACTOR.

#### *D. Reduction in Payment*

1. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

a. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;

b. Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens;

c. there are other items entitling OWNER to a set-off against the amount recommended; or

d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02.B.5.a through 14.02.B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

3. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.02.C.1.

#### 14.03 *CONTRACTOR's Warranty of Title*

A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

#### 14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within 14 days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion,

ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

#### 14.05 *Partial Utilization*

A. Use by OWNER at OWNER's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of paragraph 5.10 regarding property insurance.

#### 14.06 *Final Inspection*

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will promptly make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

#### 14.07 *Final Payment*

##### A. *Application for Payment*

1. After CONTRACTOR has, in the opinion of ENGINEER, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other

indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

##### B. *Review of Application and Acceptance*

1. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

##### C. *Payment Becomes Due*

1. Thirty days after the presentation to OWNER of the Application for Payment and accompanying documentation, the amount recommended by ENGINEER will become due and, when due, will be paid by OWNER to CONTRACTOR.

#### 14.08 *Final Completion Delayed*

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not

fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

#### 14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

### ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

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#### 15.01 *OWNER May Suspend Work*

A. At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefor as provided in paragraph 10.05.

#### 15.02 *OWNER May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.07 as adjusted from time to time pursuant to paragraph 6.04);

2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;

3. CONTRACTOR's disregard of the authority of ENGINEER; or

4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in paragraph 15.02.A occur, OWNER may, after giving CONTRACTOR (and the surety, if any) seven days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by OWNER arising out of or relating to completing the Work, such excess will be paid to CONTRACTOR. If such claims, costs, losses, and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and, when so approved by ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

C. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

#### 15.03 *OWNER May Terminate For Convenience*

A. Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. for reasonable expenses directly attributable to termination.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

#### 15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon

seven days written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

### ARTICLE 16 - DISPUTE RESOLUTION\*

#### 16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of paragraphs 9.09 and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

### ARTICLE 17 - MISCELLANEOUS\*

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#### 17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

#### 17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to

exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Agreement.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

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## **SUPPLEMENTARY CONDITIONS**

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## **SUPPLEMENTARY CONDITIONS**

### **AMENDMENTS TO GENERAL CONDITIONS**

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract (No. 1910-8, 1996 edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

#### **ARTICLE I. DEFINITIONS AND TERMINOLOGY**

Add the following language at the beginning of definition I.Q1A.12 entitled "Contract Documents" in the General-Conditions:

"The Advertisement for Bids, Instructions to Bidders, State Regulations, ..."

Delete the words "The individual or entity named as such in the Agreement" in 1.01.A.19 and insert the following in their place:

"The individual or entity duly appointed by the Owner to undertake the duties and powers herein assigned to the Engineer, acting either directly or through duly appointed representatives."

Delete the words "and who is identified as such in the Supplementary Conditions" at the end of definition 1.01 A.20, entitled "ENGINEER'S Consultant."

Delete definition 1.01 A.41 entitled "Specifications" in the General Conditions in its entirety and insert the following in its place:

"Sections included under Division 1 through Division 16 of the Contract Documents:"

#### **ARTICLE 2. PRELIMINARY MATTERS**

##### **SC-2.05**

Delete paragraph 2.0SC of the General Conditions in its entirety and insert the following in its place:

"C. Evidence of Insurance: CONTRACTOR shall deliver to OWNER, with a copy to the ENGINEER, Certificates of Insurance within 10 days after receipt of the notice of the acceptance of bid (and other evidence requested by OWNER) which CONTRACTOR is required to purchase and maintain in accordance with the requirements of Article 5."

ARTICLE 3. CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE  
SC-3.0

Add the following sentence at the end of Paragraph 3.01A of the General Conditions:

"...by all. Each and every provision of law and clause required by law to be inserted in these Contract Documents shall be deemed to be inserted herein, and they shall be read and enforced as though it were included herein, and if through mistake or otherwise, any such provision is not inserted, or if not correctly inserted, then upon the application of either party, the Contract Documents shall forthwith be physically amended to make such insertion."

ARTICLE 4. AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS;  
REFERENCE POINTS

SC-4.02

Delete the term "Supplementary Conditions" of paragraph 4.02 A of the General Conditions and replace it with "Contract Documents".

SC-4.04

Change "of" to "or" on line 6 of paragraph 4.04 B.2 of the General Conditions. Delete the following words from lines 8 and 9 of paragraph 4.04 B.2 of the General Conditions:

"...Or not shown or indicated with reasonable accuracy..."

SC-4.05

Add a new paragraph immediately after paragraph 4.05A of the General Conditions which is to read as follows:

B. ENGINEER may check the lines elevations and reference marks set by CONTRACTOR, and CONTRACTOR shall correct any errors disclosed by such check. Such a check shall not be considered as approval of CONTRACTOR'S work and shall not relieve CONTRACTOR of the responsibility for construction of the entire Work in accordance with the Contract Documents. CONTRACTOR shall furnish personnel to assist ENGINEER in checking lines and grades."

SC-4.06

Delete the term Supplementary Conditions in paragraph 4.06A of the General Conditions and replace it with "Contract Documents".

ARTICLE 5. BOND AND INSURANCE

NOTICE TO CONTRACTOR:

1. Proof of Insurance coverage shall be furnished to the OWNER in accordance with the schedule for submittal of Bonds and Agreements.
2. Additionally refer to Article 2. PRELIMINARY MATTERS, Paragraph SC-2.05.C

#### SC-5.01

Insert these sentences following SC-5.01.A: The Surety Company providing the bonds shall have a rating of A or better within the Best Key Rating Guide and be licensed by the Massachusetts Division of Insurance. The contractor shall pay the premiums for such Bonds.

#### SC-5.03

Delete the second sentence following SC-5.03.A: of the General Conditions, which beings "OWNER shall deliver to..."

#### SC-5.04

The limits of liability for the insurance required by paragraph 5.04A of the General Conditions shall provide coverage for not less than the following amounts or greater where required by law:

##### 5.4 A.1 and 5.04 A.2 Worker's Compensation

(1) Worker's Compensation	Statutory Requirements
(2) Coverage B - Employer's Liability	\$100,000/\$500,000/\$100,000

5.04 A.3, 5.04 A.4, and 5.04 A.5 Commercial General Liability Limits shall include Coverage for... independent Contractors, Personal Injury, Owners and Contractors Protective Liability, Explosion, Underground and Collapse, Broad Form Property Damage, Blanket Contractual Liability per locations/project endorsement.

Commercial General Liability	\$1,000,000/\$2,000,000
Products/completed Operations	\$2,000,000 Aggregate

##### 5.4 A.6 Automobile Liability for owned, hired and non-owned vehicles:

(1) Bodily injury:	\$1,000,000/\$1,000,000	Each person
	\$1,000,000/\$1,000,000	Each accident
(2) Property damage	\$1,000,000	Each occurrence

*The following indemnity agreement: shall be made part of this contract:*

1.To the fullest extent permitted by law, Contractor(s) hereby acknowledges and agrees that it shall indemnify, hold harmless and defend the Engineer, the Owner, the Engineer and any of their officers, directors, employees, agents, affiliates, subsidiaries and partners from and against all-claims, damages, losses and expenses, including but not limited to, attorney's fees, arising out of or resulting from the performance of the contractor's work under this contract, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury to or destruction of tangible property (other than to the work itself) including loss of use resulting therefrom, and (2) is (CAUSED) in whole or in part by any

negligent acts omissions of the contractor, its employees, agents or contractors or anyone directly or indirectly employed by any of them, or anyone whose acts any of them may be liable.

2. The Contractor hereby acknowledges its obligation under the foregoing paragraph to indemnify the Engineer and Owner against judgments suffered because of the contractor's work and to assume the cost of defending the Engineer and Owner against claims as described in the foregoing paragraph.

A. Engineer and Owner shall be named as Additional Insured on contractors General Liability and Umbrella Liability Contractors.

The Contractual Liability required by paragraph s.04n.4 of the General Conditions shall provide coverage for not less than the following amounts:

(1) Bodily injury:	\$1,000,000 Each occurrence \$1,000,000 Annual aggregate
(2).Property damage, including explosion, collapse and underground coverage:	\$1,000,000 Each occurrence \$1,000,000 Annual aggregate

SC-5.04

Add two new paragraphs immediately after paragraph 5.04B of the General Conditions, which are to read as follows:

"C. The CONTRACTOR shall also provide:

1. CONTRACTOR shall, as a minimum, purchase and maintain excess liability insurance in the umbrella form with a combined single limit of not less than \$5,000,000 per claim and in the aggregate. Evidence of such excess liability shall be delivered to OWNER in accordance with paragraph 2.0SC in the form of a certificate indicating the policy numbers and limits of liability of all underlying insurance.

A. General Liability, Workers' Compensation, Automobile Liability and Umbrella Liability Policies will contain waivers of subrogation in favor of the Engineer and Owner.

2. If the aggregate limits of liability indicated in CONTRACTOR' insurance provided in accordance with paragraphs 5.03 and 5.04 are not sufficient to cover all claims for damages arising from his operations under this Contract and from any other work performed by him or if policies of insurance do not provide that the aggregate limits of liability for bodily injury and property damage apply to each contract or project separately, CONTRACTOR shall have such policies amended so that the aggregate limits of liability required by this Contract will be available to cover all claims for damages due to operations under this Contract."

SC-5.05

Delete paragraph 5 .05 of the General Conditions in its entirety.

#### SC-5.06

Delete Paragraph 5.06 A of the General Conditions in its entirety and insert the following in its place:

"A. CONTRACTOR shall purchase and maintain, until final payment, property insurance upon the Work at the site in an amount equal to the total bid price for the completed construction. This insurance shall include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER and ENGINEERS consultants in the Work, shall insure against the perils of fire and extended coverage, shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and shall include damages, losses and expenses rising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). This insurance shall be provided on the completed value form.' If not covered under the "all risk" insurance or otherwise provided in these Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment." A \$20,000 deductible shall be acceptable. Any other deductible amount shall be approved in advance by the OWNER and any deductible amount shall be borne by the CONTRACTOR.

Delete paragraph 5.068 of the General Conditions in its entirety.

Delete Paragraph 5.06C of the General Conditions in its entirety and insert the following in its place:

"C. All the policies of insurance (or the certificates or other evidence thereof) required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER by certified mail and will contain waiver provisions in accordance with paragraph 5.078. The words "**Endeavor** to" shall be struck from the Certificate Of Insurance in the Cancellation Statement"

Delete paragraph 5.06D of the General Conditions in its entirety.

Delete paragraph 5.06E of the General Conditions in its entirety.

#### SC-5.07

Amend the last sentence of paragraph 5.07A of the General Conditions by striking out the words "held by OWNER as trustee or." As so amended, paragraph 5.07A remains in effect.

#### SC-5.08

Delete paragraph 5.08A of the General Conditions in its entirety.

Delete paragraph 5.0813 of the General Conditions in its entirety.

SC-5.09

Delete paragraph 5.09A of the General Conditions in its entirety and insert the following in its place:

"A. If OWNER has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by CONTRACTOR in accordance with this Article 5 on the basis of its not complying with the Contract Documents, OWNER will notify CONTRACTOR in writing thereof within thirty days of the date of delivery of such certificates to OWNER in accordance with paragraph 2.0SC. CONTRACTOR will provide such additional information in respect of insurance provided by him as OWNER may reasonably request."

ARTICLE 6. CONTRACTOR'S RESPONSIBILITIES

SC-6.01

Delete paragraph 6.01B of the General Conditions in its entirety and replace with the following:

"B. At the site of the Work the CONTRACTOR shall employ a full-time construction superintendent or foreman who shall have full authority to act for the CONTRACTOR. It is understood that such representative shall be acceptable to the ENGINEER and shall be one who will be continued in the capacity for the particular job involved unless the representative ceases to be on the CONTRACTOR'S payroll. If at any time during the Work the representative is deemed by the ENGINEER to be no longer acceptable, the representative shall be promptly replaced by the CONTRACTOR. All communications to the superintendent shall be as binding as if given to the CONTRACTOR."

SC-6.04

Add the following paragraph after paragraph 6.04 A.2 of the General Conditions: -

"B. The CONTRACTOR's resident superintendent shall attend monthly progress meetings at the site of the work with the ENGINEER and others as appropriate to review schedule status and such other pertinent subjects as may be listed on the agenda by the ENGINEER."

SC-6.17

In paragraph 6.17 E.1 of the General Conditions, delete the word "timely" from the first line.

SC-6.20

Delete paragraph 6.20A of the General Conditions in its entirety and replace with the following:

"A. To the fullest extent permitted by law, the CONTRACTOR shall indemnify and hold harmless the OWNER, the ENGINEER, ENGINEER'S consultants, and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys fees, arising out of or resulting from the performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness,

disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused in whole or in part by acts or omissions of the CONTRACTOR, a subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall apply to any such claims, damages, losses and expenses which arise and/or are incurred by any person or entity either during the performance of the Work and/or alter completion of construction. Nothing in this paragraph shall be construed to negate, abridge, or reduce other rights or obligations of indemnity or contribution which would otherwise exist as to a party or person indemnified hereunder. CONTRACTOR hereby assumes the responsibility and liability for injury to or death of any and all persons, including the. CONTRACTOR's employees, and for any and all damage to property caused by, resulting from, or arising out of any act, omission or neglect on the part of the CONTRACTOR, or of any Subcontractor or of anyone directly or indirectly employed by any of them or of anyone for whose acts, any of them may be liable."

Delete paragraph 6.20C of the General Conditions in its entirety.

#### ARTICLE 8. OWNER'S RESPONSIBILITIES

##### SC-8.06

Delete paragraph 8.06A of the General Conditions in its entirety.

#### ARTICLE 9. ENGINEER'S STATUS DURING CONSTRUCTION

##### SC-9.01

Add a new paragraph 9.0113 after paragraph 9.01A of the General Conditions, which is to read as follows:

"B. Nothing contained in the Contract Documents shall be construed to create a contractual relationship of any kind (1) between the ENGINEER and CONTRACTOR, (2) between the OWNER and a Subcontractor or Subcontractors, or (3) between any person or entities other than the OWNER and CONTRACTOR. The ENGINEER shall, however, be entitled to performance and enforcement of obligations under the CONTRACT DOCUMENTS intended to facilitate performance of the ENGINEERS duties."

#### ARTICLE 11. COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

Delete Article 11 of the General Conditions in its entirety and replace with the following:

"A. The unit price of an item of Unit Price work shall be subject to reevaluation and adjustment under the following conditions:

(1) If the total extended bid price [Estimated Quantity times the Bid Unit Price] of a particular item of Unit Price Work amounts to 5 percent or more of the Original Contract Price and the variation in the quantity of the particular item of Unit Price Work performed by CONTRACTOR differs by more than 15 percent from the estimated quantity of such item indicated in the Agreement;  
and

(2) If there is no corresponding adjustment with respect to any other item of work; and

(3) If CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof, CONTRACTOR may make a claim for an adjustment in the Contract Price in accordance with Article 11- if the parties are unable to agree as to the effect of any such variations in the quantity of Unit Price Work performed. If OWNER believes that the quantity variation entitles OWNER to an adjustment in the unit price, OWNER shall be entitled to an adjustment in the unit price in an amount determined by the ENGINEER. ENGINEER shall not be liable in connection with any determination relating to adjustments which is rendered in good faith."

## ARTICLE 12. CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

### SC-12.06

Add the following new paragraphs after paragraph 12.06 of the General Conditions:

#### "12.07 Liquidated Damages:

A. If the CONTRACTOR shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the OWNER, then the CONTRACTOR does hereby agree, as a part consideration for the awarding of this Contract, to pay to the OWNER the amount specified in the Contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contract shall be in default after the time stipulated in the Contract for completing the work. Such damages may be retained from time to time by the OWNER from progress payments or any amounts owing to the CONTRACTOR, or otherwise collected.

B. The said amount is fixed and agreed upon by and between the CONTRACTOR and the OWNER because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the OWNER would in such event sustain, and said amount is agreed to be the amount of damages which the OWNER would sustain and said amount shall be retained from time to time by the OWNER from current periodical estimates.

C. It is further agreed that time is of the essence of each and every portion of this Contract and of the specifications wherein as definite and certain length of times is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract. Provided that the CONTRACTOR shall not be charged with liquidated damages of any excess cost when the OWNER determines that the CONTRACTOR is without fault and the CONTRACTOR'S reasons for the time extension are acceptable to the OWNER; Provided, further, that the CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

1) to any preference, priority or allocation order duly issued by the Government;

2) to unforeseeable cause beyond the control and without the fault or negligence of the CONTRACTOR, including, but not restricted to, acts of God, or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a contract with the OWNER, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather; and



3) to any delays of subcontractors or suppliers occasioned by any of the causes specified in subsections C(1) and C(2) above;

D. Provided, further, that the CONTRACTOR shall, within ten (10) days from the beginning of such delay, unless the OWNER shall grant a further period of time prior to the date of final settlement of the Contract, notify the OWNER, in writing, of the causes of the delay, who shall ascertain the facts and extent of the delay and notify the CONTRACTOR within a reasonable time of its decision in the matter."

#### ARTICLE 13. TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

SC-13.07

Delete paragraph 3.07A of the General Conditions and insert the following in its place:

"A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any work is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) correct such defective work, or, if it has been rejected by OWNER, remove it from the site and replace it with work that is not defective, and (ii) satisfactorily correct or remove and replace any damage to other work or the work of others therefrom. If CONTRACTOR does not begin the repairs ten (10) days of receipt of written notification and promptly comply with the terms of OWNER's written instructions, or in an emergency when delay would cause serious risk, loss or damage, OWNER may have the defective work corrected or the rejected work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR."

SC-13.09

Revise paragraph 13.09A of the General Conditions

A. Delete the word "seven" and replace it with the word "ten" so that it reads "after ten days written notice to CONTRACTOR."

#### ARTICLE 14. PAYMENTS TO CONTRACTOR AND COMPLETION

SC-14.02

Delete paragraph 14.02A.3 and insert the following in its place:

"3. Retainage with respect to progress payments will be five percent or, if stipulated, the maximum allowed by law."

Add Paragraph 4. to read as follows:

"4. The CONTRACTOR shall submit Weekly Payroll Records Report and Statement of

Compliance verifying compliance with the Minimum Prevailing Wage Law, MGL ch. 149, Sections 26-27H. "These Statements of Compliance shall be submitted as a condition of payment for work performed during the period the reports apply."

#### SC-14.03

Delete paragraph 14.03A in its entirety and insert the following in its place:

"A CONTRACTOR warrants and guarantees that title to all work, material and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than at the time of Application for Payment free and clear of all liens. CONTRACTOR shall provide written transfer of title and a certified paid invoice provided by the supplier."

### ARTICLE 15. SUSPENSION OF WORK AND TERMINATION

#### SC-15.02

Add a new paragraph immediately after paragraph 15.02 AA of the General Conditions which is to read as follows:

"5. If the Work to be done under this Contract shall be abandoned, or if this Contract or any part thereof shall be sublet, without the previous written consent of OWNER, or if the contract or any claim thereunder shall be assigned by CONTRACTOR otherwise than as herein specified;"

### ARTICLE 17. MISCELLANEOUS

#### SC-17.06, 17.07, 17.08, 17.09

Add the following new paragraphs after paragraph 17.05 of the General Conditions:

"17.06 Assignment:

A. The CONTRACTOR shall not assign the whole or any part of this Contract or any moneys due or to become due hereunder until thirty (30) days prior notice in writing has been given to the OWNER of the intention to assign, which notice shall state the identity and address of the prospective assignee. No assignment shall be made without the OWNER's prior written consent. Such consent shall not be unreasonably withheld. In case the CONTRACTOR assigns all or any part of the moneys due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any moneys due or to become due to the CONTRACTOR shall be subject to prior claims of all persons, firms and corporations of services rendered or materials supplied for the performance of the work called for in this Contract."

#### 17.7 Liability

It is understood and agreed that members of the OWNER or the ENGINEER' or any agent or employees of the OWNER signing this Agreement shall not be personally liable hereunder for any action incurred in connection with this Agreement.

#### 17.8 State Statutes and Regulations

See Superseding Changes To General & Supplementary Conditions 12/29/04 for further modifications of the General Conditions due to state statutes and regulations.

#### 17.9 Severability

If any provision of this Agreement shall be invalid or unenforceable to any extent or in any application, then the remainder of this Agreement and of such terms and conditions, except to such extent or in such application, shall not be affected thereby, and each and every term and condition of this Agreement shall be valid and enforced to the fullest extent and in the broadest application permitted by law."

END OF SECTION

**STATE STATUTES AND REGULATIONS  
COMMONWEALTH OF MASSACHUSETTS**

**A. REVISIONS TO GENERAL CONDITIONS**

1. Definitions
2. Subsurface Conditions Found Different
3. Subcontracting
4. Permits
5. Contractor Records
6. Massachusetts Sales and Use Tax I
7. Clarifications and Interpretations
8. Change of Contract Price
9. Payments
10. Suspension of Work and Termination
11. Labor Classification and Minimum Wage Rates

**B. OTHER REGULATORY REQUIREMENTS**

1. Working Hours
2. DEP Community Sound Level Criteria

ATTACHMENT A – Wage Rates

ATTACHMENT B

Excerpts from Chapter 149 and Chapter 30 of the Massachusetts General Law

ATTACHMENT C - (not used on this project)

Special Provisions for Minority/Women Business Enterprises and the Commonwealth of Massachusetts Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program.

ATTACHMENT D--

Change Orders

## A. REVISIONS TO GENERAL CONDITIONS:

### 1. Definitions

The term "AWARDING AUTHORITY," as used herein, shall be considered to be synonymous with the term "OWNER," described in definition 1.01 A.30.

Delete definition 1.01 A.43 entitled "Substantial Completion" in the General Conditions in its entirety and insert the following in its place:

"Substantial Completion shall be interpreted in accordance with Massachusetts General Law Chapter 30, Section 39G or -39K as appropriate."

### 2. Subsurface Conditions Found Different

Add the following sentence to the end of paragraph 4.03A of the General Conditions:

"...to do so. Adjustments resulting from subsurface or latent physical conditions will be in accordance with Massachusetts General Law Chapter 30, Section 39N."

### 3. Subcontracting

Add the following language at the end of paragraph 6.06F of the General Conditions:

"Except as required otherwise by Massachusetts General Law Chapter 149, Section 44F, for Work governed by Chapter 149, sections 44A through 44H."

### 4. Permits

Delete paragraph 6.08A of the General Conditions in its entirety and insert the following in its place:

"A. The AWARDING AUTHORITY shall be responsible for identifying and obtaining all federal, state, and local permits required by the nature and location of construction, including but not limited to railroad permits, building construction permits, and permits for street and highway cuts and openings. CONTRACTOR shall be responsible for obtaining all permits required of his equipment, work force, or particular operations (such as blasting) in the performance of the Work and not otherwise specified to be obtained by the AWARDING AUTHORITY. These permit fees shall be paid by CONTRACTOR. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of bids, or, if there are no Bids, on the Effective Date of the Agreement."

### 5. Contractor Records

Add a new paragraph immediately after paragraph 6.09C of the General Conditions, which is to read as follows:

"D. The CONTRACTOR shall comply with all applicable provisions Chapter 30, Section 39R of the Massachusetts General Laws Regarding, CONTRACTOR'S records."

6. Massachusetts Sales and Use Tax

Add the following paragraph after paragraph 6.10A of the General Conditions:

"B. The material and supplies to be used by the CONTRACTOR in the Work of this Contract are exempt from the Sales and Use Tax of the Commonwealth of Massachusetts. The AWARDING AUTHORITY tax exemption certificate number will be furnished to the CONTRACTOR."

7. Clarifications and Interpretations

Add the following language at the end of paragraph 9.04A of the General Conditions:

"The ENGINEER'S interpretation will be made in accordance with the requirements of Massachusetts General Law Chapter 30, Section 39P."

8. Change of Contract Price

Delete paragraphs 11.01, 11.02, and 12.01 of the General Conditions, having to do with Change of Contract Price. Changes in contract price will be governed by the section called "Change Orders" in Attachment D, Section XXX and Article 11 in the Supplementary Conditions.

9. Payments

Delete paragraph 12.028.1 of the General Conditions, in its entirety and insert the following in its place:

"1. Progress Payments will be made in accordance with the Massachusetts General Law Chapter 30, Section 39G or 39K, as applicable."

Add the following new paragraph following paragraph 14.02C.1 of the General Conditions:

"2. The CONTRACTOR shall make payments to Subcontractors in accordance with the requirements of Massachusetts General Law Chapter 30, Section 39F."

Delete paragraph 14.07B of the General Conditions in its entirety and insert the following in its place:

"1. If, on the basis of the ENGINEER's observation of the Work during construction and final inspection and, upon the ENGINEER's review of the final Application for Payment and accompanying documentation, the ENGINEER is satisfied that the Work has been completed and that the CONTRACTOR's other obligations under the Contract Documents have been fulfilled, the ENGINEER will indicate in writing his recommendation of payment and present the Application to the AWARDING AUTHORITY for payment. Thereupon the ENGINEER will give written notice to the AWARDING AUTHORITY and the CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.15. Otherwise, the ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment. In such case the CONTRACTOR shall make the

necessary corrections and resubmit the Application. If the Application and accompanying documentation are appropriate as to form and substance, the AWARDING AUTHORITY shall in accordance with the applicable Massachusetts General Law, pay the CONTRACTOR the amount recommended by the ENGINEER."

10. Suspension of Work and Termination

Delete paragraph 15.01A of the General Conditions in its entirety and insert the following in its place:

"A. The AWARDING AUTHORITY may order, at any time and without cause, the CONTRACTOR to suspend or delay the Work in accordance with Massachusetts General Law Chapter 30, Section 39-0."

11. Labor Classifications and Minimum Wage Rates

Add the following paragraphs under the heading "Wage Rates" after paragraph 17.10 of the Supplementary Conditions:

"17.11 Wage Rates

- A. Minimum wage rates as determined by the Commissioner of the Department of Labor and Industries under the provisions of Massachusetts General Laws Chapter 149, Sections 26-270 apply to this project. A copy of the wage schedule is included in the front end of the specifications under Federal Minimum Wage Rates. If, after the Notice of Award, it becomes necessary to employ any person in a trade or occupation not classified in the wage determinations, such person shall be paid at not less than such rates as shall be determined by the Commissioner. Such approved minimum rate shall be retro- active to the time of the initial employment of such person in such trade or occupation. The CONTRACTOR shall notify the AWARDING AUTHORITY of its intention to employ persons in trades or occupations not classified in the wage determinations as soon as possible in order to allow sufficient time for the AWARDING AUTHORITY to obtain approved rates for such trades or occupations.
- B. The schedule of wages referred to above are minimum rates only, and the AWARDING AUTHORITY will not consider any claims for additional compensation made by CONTRACTOR because of payment by the CONTRACTOR of any wage rate in excess of the applicable rate contained in the Contract.
- C. The said schedule of wages shall continue to be the minimum rates to be paid during the life of this Agreement and a legible copy of said schedule shall be kept posted in a conspicuous place at the site of the Work.
- D. CONTRACTOR and subcontractors shall submit a copy of weekly payroll records to the AWARDING AUTHORITY and the AWARDING AUTHORITY shall retain the records of a minimum of three years."

## B. OTHER REGULATORY REQUIREMENTS:

### 1. Working Hours

No laborer, workman, mechanic, foreman, or inspector, working within the Commonwealth, in the employ of the CONTRACTOR, subcontractor, or other person doing or contracting to do the whole or a part of the work contemplated by this contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency.

### 2. DEP Community sound Level Criteria

The Community Sound Level Criteria as established by the Commonwealth of Massachusetts Department of Environmental Protection (DEP) must be conformed to prior to the AWARDING AUTHORITY's acceptance of the structure. The following sound level criteria must be met at the construction site:

- A. The increase in the broad band noise level shall not be in excess of ten (10) dB(A) above ambient at the station boundary. The ambient level is defined as the A-weighted noise level that is exceeded ninety (90) percent of the time measured during the period in question.
- B. The primary noise source(s) shall not produce a puretone condition. Puretone is any given octave band center frequency that exceeds the two adjacent center frequencies by three (3) or more decibels.

END OF SECTION



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**SUPERSEDING CHANGES TO  
GENERAL AND SUPPLEMENTARY CONDITIONS**

1. GENERAL CONDITIONS

2.06A - insert at end: Said conference shall be scheduled and arranged by the Contractor. I

4.01B - delete

4.06G - delete

5.07B - delete

6.17E - restore the word "timely" in the first line. Delete the word "only" from the 5<sup>th</sup> line. Where "only" has been deleted, insert "to determine their general conformance with the contract documents, in accordance with good and accepted engineering practices, and".

8.02A - delete "to whom contractor makes no reasonable objection".

9.02A - Insert, after "Work" in the 6<sup>th</sup> line, "While construction is active at the project, said visits and inspections will take place at least once per week."

12.06 - delete subparts A and B, and replace with the following: "The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Engineer on account of any delay in the commencement of the Work and/or any delay in, or suspension of any portion of the Work, whether such delay is caused by the Owner, the Engineer, or otherwise. The Contractor acknowledges that the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in these general conditions.

No claims shall be allowed on account of the failure of the Engineer to furnish Drawings, specifications or instructions or to return Shop Drawings or Samples until the expiration of the applicable time period referenced in Mass. Gen. L. c. 30, §39P, and not then unless such claim be reasonable.

No extension of time shall be granted because of seasonable or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the Contract, whether occurring within the time originally scheduled for completion, or within any period of extension granted. There shall be no increase in the Contract Sum on account of any additional costs or operations or conditions resulting therefrom.

14.02C - change "Ten" to "Twenty-One"

14.07A(3) - delete the first three lines through the word "Owner,". In the third line, after Contractor, substitute "shall" for "may". In the fourth line, after the word "full" insert "on behalf of both Contractor and all of its Subcontractors,".

14.09A(1) - delete -

15.03B - add after "termination" ", with respect to this project or any other project of the Contractor."

Add "15.03C. If this Contract is terminated by Owner with or without cause, and regardless of whether said termination is rightful or wrongful, in no event shall the Contractor be paid a sum which, together with prior payments to Contractor, exceeds the sum payable to Contractor under the Agreement (Section 00520), as adjusted by any agreed change orders.

## II. SUPPLEMENTARY CONDITIONS

### Article V - Bonds and Insurance

Employer's liability coverage must be \$2 million per accident, \$2 million disease limits, and \$2 million per employee disease limits.

General liability insurance limits must be \$5 million aggregate, \$2 million dollars' products/completed operations aggregate; \$2 million personal injury and advertising; and \$2 million per occurrence.

The contractual liability insurance coverage must have limits corresponding to the foregoing. At 5.04A.6, the following changes should be made to paragraph I of the indemnity clause: four lines from the bottom, the parenthesis should be removed from the word "CAUSED" and the word "CAUSED" should be changed to lower-case (caused). Also, in the last line of said clause, insert the word "for" after the word "anyone."

At SC-5.04C 1 - insert the following sentence at the end: "The Contractor's excess liability insurance coverage must follow from with its underlying liability coverages."

SC-6.20A - insert the word "defend" after the word "shall" in the first line.

SC-14.02A.3 - insert the following sentence at the end: "Retainage for the entire project will be withheld until substantial completion of the entire project, at which time retainage shall be accounted for, subject to all of the other terms and conditions of payment at the time of substantial completion.

Add the following Article SC-18.

### SC-I 8 Arbitration - J

18.1 Controversies and Claims Subject to Arbitration. Any Claim arising out of or related to the Contract, or the breach thereof, except claims relating to aesthetic effect, shall be settled by arbitration, subject to the provisions of Subparagraph 18.7. Arbitration will be conducted in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association and judgment upon the award rendered by the Arbitrator or Arbitrators may be entered in any Court having jurisdiction thereof. In any such arbitration in which the amount stated in the demand is \$100,000 or less, a single arbitrator shall be appointed in accordance with the procedures set forth in the American Arbitration Association Construction Industry Arbitration Rules. In any such arbitration in which the amount stated in the demand is in excess of \$100,000, a panel of three arbitrators shall be appointed in accordance with the procedures set forth in the American Arbitration

Association Construction Industry Arbitration Rules. The parties may agree to use any arbitration service. In the absence of such agreement, the American Arbitration Association shall be utilized.

18.2 Rules For Arbitration. If the neutral arbitrator is appointed by the American Arbitration Association, the said Association shall administer the arbitration and its Construction Industry Arbitration Rules shall govern all aspects of the proceeding including the enforcement of any award. If the neutral arbitrator is not appointed by the American Arbitration Association, then the panel of arbitrators shall act as the administrator of the arbitration but the Construction Industry Arbitration Rules of the Association shall nonetheless govern all aspects of the proceeding, including the enforcement of any award. The arbitration panel shall have all the powers and duties conferred on the Association pursuant to said rules.

In addition, the following rules shall govern the selection of arbitrators and the proceedings:

18.2.1 Neither party may appoint as arbitrator an employee or an owner of that party, nor the parent, spouse or child of an employee or owner of that party.

18.2.2 After the neutral arbitrator has been appointed, neither party may engage in ex parte communication with the arbitrator appointed by that party.

18.2.3 Contract Performance During Arbitration. During arbitration proceedings, the Owner and Contractor shall otherwise continue their performances hereunder.

18.3 When a written decision of the Engineer states that the decision is final, any demand for arbitration of the matter covered by such decision must be made within two months after substantial completion of the project, as determined by the Engineer in accordance with the provisions hereof. The failure to demand arbitration within said two month period will result in the Engineer's decision becoming final and binding upon the Owner and the Contractor.

18.4 A Demand for arbitration shall be made with the time limits specified in Subparagraph 18.3, and in no event shall be made after the date when the institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations.

18.5 Claims and Timely Assertion of Claims. A party who files a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded. When a party fails to include a claim through oversight, inadvertence or excusable neglect, or when a Claim has matured or been acquired subsequently, the arbitrator or arbitrators may permit amendment.

18.6 Judgment on Final Award. The award rendered by the arbitrator or arbitrators shall be final, and the judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

18.7 Notwithstanding any provision contained in this Paragraph 18 or elsewhere in the Contract Documents, the Owner reserves the following right in connection with claims and disputes between the Owner and Contractor:

1. the right to institute the legal action against the Contractor in any court of competent jurisdiction in-lieu of demanding arbitration pursuant to this paragraph 18, in which case the dispute or disputes which are the subject of such action shall be decided by such court, and not by arbitration.

2. the right to obtain from any court of competent jurisdiction a stay of any arbitration instituted by the Contractor, provided that the application for such stay is made before the appointment of the neutral arbitrator in such arbitration, in which case the dispute or disputes which are the subject of such arbitration shall be decided by such court, and not by arbitration;

3. the right to require the Contractor to join as a party in any arbitration between the Owner and Architect relating to the Project in which case the Contractor agrees to be bound by that decision of the arbitrator arbitrators in such arbitration.

In case the Owner elects to proceed in accordance with 18.7.1 or 18.7.2 above, the word "litigation", shall be deemed to replace the word "arbitration" wherever the latter word appears in the Contract Documents.

#### SC-19 MBE and WBE participation

The Contractor shall comply with the provision of G.L.c. 7 40N, and any associated regulations effective during the time of the project, relative to the participation of minority and women-owned businesses in connection with the project. At present, the current participation goals are 7.4% MBE and 4% WBE.

END OF SECTION

## EQUAL OPPORTUNITY REQUIREMENTS

### 1. EQUAL EMPLOYMENT OPPORTUNITY

A. Equal Employment Plan: The Contractor and each Subcontractor shall implement an effective affirmative action plan to assure equal employment opportunity throughout the performance of work on this project. Do not discriminate against any employee or applicant for employment because of race, color, sex, religion, age, or national origin. Affirmative action plan shall include, but not be limited to, the following:

1. Employment, upgrading, demotion, or transfer.
2. Recruitment or recruitment advertising.
3. Layoff or termination.
4. Rates of pay or other forms of compensation.
5. Selection for training, including apprenticeship.

B. Rules and Regulations: The Contractor and each Subcontractor shall comply with all applicable local, state and federal laws and regulations regarding equal employment opportunity and with the provisions of the following:

1.. Governors "Executive Order No. 74", dated July 20, 1970, entitled the "Governor's Code of Fair Practices", as amended by the Governor's Executive Order No. 116, dated May 1, 1975.

2. The Fair Employment Practices Law of the Commonwealth, Chapter 1518 of the General Laws of Massachusetts, as amended.

3. The rules and regulations of the Massachusetts Commission Against Discrimination as in force at the date of the Contract.

4. The rules, regulations and relevant orders of the United States Secretary of Labor, the Commonwealth of Massachusetts Department of Labor and Industries, and other authorities having jurisdiction as in force at the date of the Contract.

5. Governor's 'Executive Order No. 237'.

C. Employment Advertisements: State in all solicitations or advertisements for employees that all qualified applicants will receive consideration for employment without regard to race, color, sex, religion, age, or national origin.

D. Referral Notices: Direct special effort toward the recruitment of minority workers through the unions and through referral agencies representing the minority community.

E. Advising Labor Unions: Send to each labor union or representative of workers with which the Contractor has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or workers' representative of the Contractor's equal employment opportunity commitment and post copies of these notices in conspicuous places available to employees and applicants for employment.

F. Posting: Post copies of equal opportunity employment notices in conspicuous places available to employees and applicants for employment and post notices setting forth the provisions of this non-discrimination equal employment opportunity clause.

G. Manning Table: Assume and be responsible for the affirmative duty of achieving the range of minority employment and women work force participation set forth in a manning table for the entire project. Submit a manning table at the request of the Owner and obtain Owners approval prior to the Award of Contract.

H. Percentage Participation: Both Contractor and Sub-contractor shall comply with requirements of Minority and Women Business percentage of Contract percentage participation requirements specified in the Minority and Women Business Enterprise Set Aside Requirements Section.

END OF SECTION

**MINORITY AND WOMEN BUSINESS  
ENTERPRISE SET ASIDE REQUIREMENTS**

1. GENERAL

A. All provisions of the Contract Documents shall be subject to all applicable provisions of law, including, without limitation, Federal, State, and Local statutes and ordinances regarding setting aside a portion of the Contract for qualified Minority and Women Business Enterprises. The Contractor shall recognize that other duties and obligations are required by laws, statutes, and ordinances which may not be provided herein, but must be considered and made a part of this Contract. In case of a conflict between the Contract Documents and applicable laws, statutes, and ordinances, the provisions of law, statutes, and ordinances shall *govern*.

2. MINORITY AND WOMEN OWNED BUSINESS ENTERPRISE SET ASIDE REQUIREMENTS

A. Requirements For minority and women business enterprise set aside requirements, provided to the Architect by the Awarding Authority Follow. The Architect does not warrant or guarantee the completeness or accuracy of this information, and every bidder and contractor shall be responsible for ascertaining the MWBE set aside requirements in the area where the work will be performed.

1. Bidders shall agree to contract with minority and women owned businesses as certified by the State Office of Minority and Women Business Assistance [SOMWBA]. "the amount of participation which shall be reserved for such enterprises shall not be less than fifteen percent [15%] of the total contract amount including accepted alternates, of which at least ten percent [10%] shall be reserved for minority business enterprises and five percent [5%] shall be reserved for womenowned business enterprises.

2. The Contractor and each Subcontractor shall furnish to the Awarding Authority, within fifteen days alter completion of its portion of the work, a certified 'Statement of Compliance' certifying compliance with minority and women business enterprise set aside requirements. Submit the 'Statement of Compliance' in a form acceptable lo the Awarding Authority.

3. See Massachusetts Executive Order 237 as amended.

END OF SECTION

MINORITY AND WOMEN BUSINESS ENTERPRISE SET ASIDE REQUIREMENTS



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To view and print Weekly Payroll & Statement of Compliance Forms, click on [www.mass.gov/dols/pw](http://www.mass.gov/dols/pw).

PLEASE NOTE: The attached Prevailing Wage Schedule is valid for 90 days. An Awarding Authority should re-request an up to date Prevailing Wage Schedule if it has NOT opened bids or selected a contractor within 90 days of the issuance date of the attached prevailing wage schedule.

\*For MULTI-YEAR projects bid on or after 8/8/08, Awarding Authorities must request an Annual Update to this Prevailing Wage Schedule each year for the duration of the project, no later than two weeks before the anniversary date of the execution of the general contract. Annual updates are not required for projects that last LESS THAN ONE YEAR.

\*For CM AT RISK projects (bid pursuant to GL c.149A), Awarding Authorities must request a Prevailing Wage Schedule NOT sooner than 90-days before the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work.

\*For MULTI-YEAR CM AT RISK projects, Awarding Authorities must request an Annual Update to this Prevailing Wage Schedule each year for the duration of the project, no later than two weeks before the anniversary date, which is the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to procure construction scopes of work.

Apprentice wages (expressed as dollar figures) and the required benefits are listed on the Prevailing Wage Schedule. For further details, please see opinion letter PW-2010-03-03.16.10 (dated March 18, 2010) at [www.mass.gov/dols/pw](http://www.mass.gov/dols/pw).

Request Prevailing Wage Rates online at: [www.mass.gov/dols/pw](http://www.mass.gov/dols/pw).

THIS IS A SYSTEM-GENERATED EMAIL. PLEASE DO NOT REPLY TO THIS EMAIL. TO CONTACT DLS REGARDING PREVAILING WAGE MATTERS, CALL 617-626-6953.

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#### APPROVAL/DENIAL COMMENTS

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CHARLES D. BAKER  
Governor

KARYN E. POLITO  
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT  
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the  
Massachusetts General Laws, Chapter 149, Sections 26 to 27H

ROSALIN ACOSTA  
Secretary  
WILLIAM D MCKINNEY  
Director

**Awarding Authority:** Town of Arlington  
**Contract Number:** 18-10 **City/Town:** ARLINGTON  
**Description of Work:** Provide all labor, materials, equipment and supervision necessary for the Restoration of Town Hall Garden Water Feature as per specifications  
**Job Location:** 730 Massachusetts Ave

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Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
<b>Construction</b>						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2016	\$33.25	\$10.91	\$10.89	\$0.00	\$55.05
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2016	\$33.32	\$10.91	\$10.89	\$0.00	\$55.12
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2016	\$33.44	\$10.91	\$10.89	\$0.00	\$55.24
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2017	\$92.97	\$9.90	\$21.15	\$0.00	\$124.02
	08/01/2018	\$97.80	\$9.90	\$21.15	\$0.00	\$128.85
	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
	For apprentice rates see "Apprentice- PILE DRIVER"					
AIR TRACK OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2017	\$38.25	\$7.70	\$14.75	\$0.00	\$60.70
	06/01/2018	\$39.20	\$7.70	\$14.75	\$0.00	\$61.65
	12/01/2018	\$40.15	\$7.70	\$14.75	\$0.00	\$62.60
	06/01/2019	\$41.15	\$7.70	\$14.75	\$0.00	\$63.60
	12/01/2019	\$42.15	\$7.70	\$14.75	\$0.00	\$64.60
	06/01/2020	\$43.14	\$7.70	\$14.75	\$0.00	\$65.59
	12/01/2020	\$44.12	\$7.70	\$14.75	\$0.00	\$66.57
	06/01/2021	\$45.14	\$7.70	\$14.75	\$0.00	\$67.59
	12/01/2021	\$46.15	\$7.70	\$14.75	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>HEAT &amp; FROST INSULATORS LOCAL 6 (BOSTON)</i>	12/01/2017	\$35.90	\$11.50	\$7.10	\$0.00	\$54.50
	06/01/2018	\$36.90	\$11.50	\$7.10	\$0.00	\$55.50
	12/01/2018	\$37.90	\$11.50	\$7.10	\$0.00	\$56.50
	06/01/2019	\$38.90	\$11.50	\$7.10	\$0.00	\$57.50
	12/01/2019	\$39.90	\$11.50	\$7.10	\$0.00	\$58.50
	06/01/2020	\$40.90	\$11.50	\$7.10	\$0.00	\$59.50
	12/01/2020	\$41.90	\$11.50	\$7.10	\$0.00	\$60.50
ASPHALT RAKER <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.63	\$10.50	\$15.50	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.63	\$10.50	\$15.50	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 1</i>	12/01/2017	\$38.25	\$7.70	\$14.75	\$0.00	\$60.70
	06/01/2018	\$39.20	\$7.70	\$14.75	\$0.00	\$61.65
	12/01/2018	\$40.15	\$7.70	\$14.75	\$0.00	\$62.60
	06/01/2019	\$41.15	\$7.70	\$14.75	\$0.00	\$63.60
	12/01/2019	\$42.15	\$7.70	\$14.75	\$0.00	\$64.60
	06/01/2020	\$43.14	\$7.70	\$14.75	\$0.00	\$65.59
	12/01/2020	\$44.12	\$7.70	\$14.75	\$0.00	\$66.57
	06/01/2021	\$45.14	\$7.70	\$14.75	\$0.00	\$67.59
	12/01/2021	\$46.15	\$7.70	\$14.75	\$0.00	\$68.60
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2017	\$42.92	\$6.97	\$16.21	\$0.00	\$66.10

**Apprentice - BOILERMAKER - Local 29**

**Effective Date - 01/01/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$27.90	\$6.97	\$10.54	\$0.00	\$45.41
2	65	\$27.90	\$6.97	\$10.54	\$0.00	\$45.41
3	70	\$30.04	\$6.97	\$11.35	\$0.00	\$48.36
4	75	\$32.19	\$6.97	\$12.16	\$0.00	\$51.32
5	80	\$34.34	\$6.97	\$12.97	\$0.00	\$54.28
6	85	\$36.48	\$6.97	\$13.78	\$0.00	\$57.23
7	90	\$38.63	\$6.97	\$14.59	\$0.00	\$60.19
8	95	\$40.77	\$6.97	\$15.40	\$0.00	\$63.14

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (BOSTON)</i>	02/01/2018	\$52.06	\$10.75	\$20.03	\$0.00	\$82.84
	08/01/2018	\$53.41	\$10.75	\$20.16	\$0.00	\$84.32
	02/01/2019	\$54.05	\$10.75	\$20.16	\$0.00	\$84.96
	08/01/2019	\$55.40	\$10.75	\$20.30	\$0.00	\$86.45
	02/01/2020	\$56.04	\$10.75	\$20.30	\$0.00	\$87.09
	08/01/2020	\$57.39	\$10.75	\$20.45	\$0.00	\$88.59
	02/01/2021	\$58.03	\$10.75	\$20.45	\$0.00	\$89.23
	08/01/2021	\$59.43	\$10.75	\$20.61	\$0.00	\$90.79
	02/01/2022	\$60.02	\$10.75	\$20.61	\$0.00	\$91.38

**Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Boston**

**Effective Date -** 02/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.03	\$10.75	\$20.03	\$0.00	\$56.81
2	60	\$31.24	\$10.75	\$20.03	\$0.00	\$62.02
3	70	\$36.44	\$10.75	\$20.03	\$0.00	\$67.22
4	80	\$41.65	\$10.75	\$20.03	\$0.00	\$72.43
5	90	\$46.85	\$10.75	\$20.03	\$0.00	\$77.63

**Effective Date -** 08/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.71	\$10.75	\$20.16	\$0.00	\$57.62
2	60	\$32.05	\$10.75	\$20.16	\$0.00	\$62.96
3	70	\$37.39	\$10.75	\$20.16	\$0.00	\$68.30
4	80	\$42.73	\$10.75	\$20.16	\$0.00	\$73.64
5	90	\$48.07	\$10.75	\$20.16	\$0.00	\$78.98

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

BULLDOZER/GRADER/SCRAPER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2017	\$38.60	\$7.70	\$14.95	\$0.00	\$61.25
	06/01/2018	\$39.55	\$7.70	\$14.95	\$0.00	\$62.20
	12/01/2018	\$40.50	\$7.70	\$14.95	\$0.00	\$63.15
	06/01/2019	\$41.50	\$7.70	\$14.95	\$0.00	\$64.15
	12/01/2019	\$42.50	\$7.70	\$14.95	\$0.00	\$65.15
	06/01/2020	\$43.49	\$7.70	\$14.95	\$0.00	\$66.14
	12/01/2020	\$44.47	\$7.70	\$14.95	\$0.00	\$67.12
	06/01/2021	\$45.49	\$7.70	\$14.95	\$0.00	\$68.14
	12/01/2021	\$46.50	\$7.70	\$14.95	\$0.00	\$69.15

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2017	\$37.45	\$7.70	\$14.95	\$0.00	\$60.10
	06/01/2018	\$38.40	\$7.70	\$14.95	\$0.00	\$61.05
	12/01/2018	\$39.35	\$7.70	\$14.95	\$0.00	\$62.00
	06/01/2019	\$40.35	\$7.70	\$14.95	\$0.00	\$63.00
	12/01/2019	\$41.35	\$7.70	\$14.95	\$0.00	\$64.00
	06/01/2020	\$42.34	\$7.70	\$14.95	\$0.00	\$64.99
	12/01/2020	\$43.32	\$7.70	\$14.95	\$0.00	\$65.97
	06/01/2021	\$44.34	\$7.70	\$14.95	\$0.00	\$66.99
	12/01/2021	\$45.35	\$7.70	\$14.95	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2017	\$37.45	\$7.70	\$14.95	\$0.00	\$60.10
	06/01/2018	\$38.40	\$7.70	\$14.95	\$0.00	\$61.05
	12/01/2018	\$39.35	\$7.70	\$14.95	\$0.00	\$62.00
	06/01/2019	\$40.35	\$7.70	\$14.95	\$0.00	\$63.00
	12/01/2019	\$41.35	\$7.70	\$14.95	\$0.00	\$64.00
	06/01/2020	\$42.34	\$7.70	\$14.95	\$0.00	\$64.99
	12/01/2020	\$43.32	\$7.70	\$14.95	\$0.00	\$65.97
	06/01/2021	\$44.34	\$7.70	\$14.95	\$0.00	\$66.99
	12/01/2021	\$45.35	\$7.70	\$14.95	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	03/01/2018	\$40.28	\$9.90	\$17.50	\$0.00	\$67.68
	09/01/2018	\$41.32	\$9.90	\$17.50	\$0.00	\$68.72
	03/01/2019	\$42.35	\$9.90	\$17.50	\$0.00	\$69.75

**Classification**

**Effective Date    Base Wage    Health    Pension    Supplemental Unemployment    Total Rate**

**Apprentice - CARPENTER - Zone 2 Eastern MA**
**Effective Date - 03/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.14	\$9.90	\$1.73	\$0.00	\$31.77
2	60	\$24.17	\$9.90	\$1.73	\$0.00	\$35.80
3	70	\$28.20	\$9.90	\$12.31	\$0.00	\$50.41
4	75	\$30.21	\$9.90	\$12.31	\$0.00	\$52.42
5	80	\$32.22	\$9.90	\$14.04	\$0.00	\$56.16
6	80	\$32.22	\$9.90	\$14.04	\$0.00	\$56.16
7	90	\$36.25	\$9.90	\$15.77	\$0.00	\$61.92
8	90	\$36.25	\$9.90	\$15.77	\$0.00	\$61.92

**Effective Date - 09/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.66	\$9.90	\$1.73	\$0.00	\$32.29
2	60	\$24.79	\$9.90	\$1.73	\$0.00	\$36.42
3	70	\$28.92	\$9.90	\$12.31	\$0.00	\$51.13
4	75	\$30.99	\$9.90	\$12.31	\$0.00	\$53.20
5	80	\$33.06	\$9.90	\$14.04	\$0.00	\$57.00
6	80	\$33.06	\$9.90	\$14.04	\$0.00	\$57.00
7	90	\$37.19	\$9.90	\$15.77	\$0.00	\$62.86
8	90	\$37.19	\$9.90	\$15.77	\$0.00	\$62.86

**Notes:**

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80  
Step 1&2 \$29.76/ 3&4 \$35.45/ 5&6 \$52.14/ 7&8 \$57.89

**Apprentice to Journeyworker Ratio:1:5**

CARPENTER WOOD FRAME	10/01/2017	\$26.25	\$7.07	\$7.86	\$0.00	\$41.18
CARPENTERS -ZONE 2 (Wood Frame)	04/01/2018	\$26.67	\$7.07	\$7.86	\$0.00	\$41.60
	10/01/2018	\$27.09	\$7.07	\$7.86	\$0.00	\$42.02
	04/01/2019	\$27.52	\$7.07	\$7.86	\$0.00	\$42.45
	10/01/2019	\$27.95	\$7.07	\$7.86	\$0.00	\$42.88

As of 9/1/09 Carpentry work on wood-frame WEATHERIZATION projects shall be paid the WOOD FRAME CARPENTER rate.



**Classification**
**Effective Date**
**Base Wage**
**Health**
**Pension**
**Supplemental  
Unemployment**
**Total Rate**
**Apprentice - CARPENTER (Wood Frame) - Zone 2**
**Effective Date - 10/01/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$15.75	\$7.07	\$0.00	\$0.00	\$22.82
2	60	\$15.75	\$7.07	\$0.00	\$0.00	\$22.82
3	65	\$17.06	\$7.07	\$7.86	\$0.00	\$31.99
4	70	\$18.38	\$7.07	\$7.86	\$0.00	\$33.31
5	75	\$19.69	\$7.07	\$7.86	\$0.00	\$34.62
6	80	\$21.00	\$7.07	\$7.86	\$0.00	\$35.93
7	85	\$22.31	\$7.07	\$7.86	\$0.00	\$37.24
8	90	\$23.63	\$7.07	\$7.86	\$0.00	\$38.56

**Effective Date - 04/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$16.00	\$7.07	\$0.00	\$0.00	\$23.07
2	60	\$16.00	\$7.07	\$0.00	\$0.00	\$23.07
3	65	\$17.34	\$7.07	\$7.86	\$0.00	\$32.27
4	70	\$18.67	\$7.07	\$7.86	\$0.00	\$33.60
5	75	\$20.00	\$7.07	\$7.86	\$0.00	\$34.93
6	80	\$21.34	\$7.07	\$7.86	\$0.00	\$36.27
7	85	\$22.67	\$7.07	\$7.86	\$0.00	\$37.60
8	90	\$24.00	\$7.07	\$7.86	\$0.00	\$38.93

**Notes:**

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80  
Step 1&2 \$18.88/ 3&4 \$26.26/ 5&6 \$33.31/ 7&8 \$35.93

**Apprentice to Journeyworker Ratio:1:5**

CARPENTER WOOD FRAME (All Other Work) CARPENTERS -ZONE 2 (Wood Frame)	06/01/2016	\$25.32	\$9.80	\$16.82	\$0.00	\$51.94
CEMENT MASONRY/PLASTERING BRICKLAYERS LOCAL 3 (BOSTON)	01/01/2018	\$46.02	\$12.35	\$22.41	\$0.30	\$81.08
	07/01/2018	\$47.41	\$12.35	\$22.41	\$0.30	\$82.47
	01/01/2019	\$48.15	\$12.35	\$22.41	\$0.30	\$83.21
	07/01/2019	\$49.54	\$12.35	\$22.41	\$0.30	\$84.60
	01/01/2020	\$50.29	\$12.35	\$22.41	\$0.30	\$85.35

**Classification**
**Effective Date**
**Base Wage**
**Health**
**Pension**
**Supplemental  
Unemployment**
**Total Rate**
**Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Boston)**
**Effective Date - 01/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.01	\$12.35	\$15.41	\$0.00	\$50.77
2	60	\$27.61	\$12.35	\$17.41	\$0.30	\$57.67
3	65	\$29.91	\$12.35	\$18.41	\$0.30	\$60.97
4	70	\$32.21	\$12.35	\$19.41	\$0.30	\$64.27
5	75	\$34.52	\$12.35	\$20.41	\$0.30	\$67.58
6	80	\$36.82	\$12.35	\$21.41	\$0.30	\$70.88
7	90	\$41.42	\$12.35	\$22.41	\$0.30	\$76.48

**Effective Date - 07/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.71	\$12.35	\$15.41	\$0.00	\$51.47
2	60	\$28.45	\$12.35	\$17.41	\$0.30	\$58.51
3	65	\$30.82	\$12.35	\$18.41	\$0.30	\$61.88
4	70	\$33.19	\$12.35	\$19.41	\$0.30	\$65.25
5	75	\$35.56	\$12.35	\$20.41	\$0.30	\$68.62
6	80	\$37.93	\$12.35	\$21.41	\$0.30	\$71.99
7	90	\$42.67	\$12.35	\$22.41	\$0.30	\$77.73

**Notes:**

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

**Apprentice to Journeyworker Ratio:1:3**

CHAIN SAW OPERATOR	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
LABORERS - ZONE 1	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES	12/01/2017	\$47.63	\$10.50	\$15.50	\$0.00	\$73.63
OPERATING ENGINEERS LOCAL 4						

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

COMPRESSOR OPERATOR	12/01/2017	\$31.80	\$10.50	\$15.50	\$0.00	\$57.80
OPERATING ENGINEERS LOCAL 4						

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

DELEADER (BRIDGE)	01/01/2017	\$51.41	\$7.85	\$16.10	\$0.00	\$75.36
PAINTERS LOCAL 35 - ZONE 2						

**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

**Effective Date - 01/01/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.71	\$7.85	\$0.00	\$0.00	\$33.56
2	55	\$28.28	\$7.85	\$3.66	\$0.00	\$39.79
3	60	\$30.85	\$7.85	\$3.99	\$0.00	\$42.69
4	65	\$33.42	\$7.85	\$4.32	\$0.00	\$45.59
5	70	\$35.99	\$7.85	\$14.11	\$0.00	\$57.95
6	75	\$38.56	\$7.85	\$14.44	\$0.00	\$60.85
7	80	\$41.13	\$7.85	\$14.77	\$0.00	\$63.75
8	90	\$46.27	\$7.85	\$15.44	\$0.00	\$69.56

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

DEMO: ADZEMAN LABORERS - ZONE I	12/01/2017	\$37.65	\$7.70	\$14.75	\$0.00	\$60.10
	06/01/2018	\$38.60	\$7.70	\$14.75	\$0.00	\$61.05
	12/01/2018	\$39.55	\$7.70	\$14.75	\$0.00	\$62.00
	06/01/2019	\$40.55	\$7.70	\$14.75	\$0.00	\$63.00
	12/01/2019	\$41.55	\$7.70	\$14.75	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BACKHOE/LOADER/HAMMER OPERATOR LABORERS - ZONE I	12/01/2017	\$38.65	\$7.70	\$14.75	\$0.00	\$61.10
	06/01/2018	\$39.60	\$7.70	\$14.75	\$0.00	\$62.05
	12/01/2018	\$40.55	\$7.70	\$14.75	\$0.00	\$63.00
	06/01/2019	\$41.55	\$7.70	\$14.75	\$0.00	\$64.00
	12/01/2019	\$42.55	\$7.70	\$14.75	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS LABORERS - ZONE I	12/01/2017	\$38.40	\$7.70	\$14.75	\$0.00	\$60.85
	06/01/2018	\$39.35	\$7.70	\$14.75	\$0.00	\$61.80
	12/01/2018	\$40.30	\$7.70	\$14.75	\$0.00	\$62.75
	06/01/2019	\$41.30	\$7.70	\$14.75	\$0.00	\$63.75
	12/01/2019	\$42.30	\$7.70	\$14.75	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER LABORERS - ZONE I	12/01/2017	\$38.65	\$7.70	\$14.75	\$0.00	\$61.10
	06/01/2018	\$39.60	\$7.70	\$14.75	\$0.00	\$62.05
	12/01/2018	\$40.55	\$7.70	\$14.75	\$0.00	\$63.00
	06/01/2019	\$41.55	\$7.70	\$14.75	\$0.00	\$64.00
	12/01/2019	\$42.55	\$7.70	\$14.75	\$0.00	\$65.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR LABORERS - ZONE I	12/01/2017	\$38.40	\$7.70	\$14.75	\$0.00	\$60.85
	06/01/2018	\$39.35	\$7.70	\$14.75	\$0.00	\$61.80
	12/01/2018	\$40.30	\$7.70	\$14.75	\$0.00	\$62.75
	06/01/2019	\$41.30	\$7.70	\$14.75	\$0.00	\$63.75
	12/01/2019	\$42.30	\$7.70	\$14.75	\$0.00	\$64.75

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER	12/01/2017	\$37.65	\$7.70	\$14.75	\$0.00	\$60.10
LABORERS - ZONE 1	06/01/2018	\$38.60	\$7.70	\$14.75	\$0.00	\$61.05
	12/01/2018	\$39.55	\$7.70	\$14.75	\$0.00	\$62.00
	06/01/2019	\$40.55	\$7.70	\$14.75	\$0.00	\$63.00
	12/01/2019	\$41.55	\$7.70	\$14.75	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
OPERATING ENGINEERS LOCAL 4						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER	08/01/2017	\$61.98	\$9.90	\$21.15	\$0.00	\$93.03
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2018	\$65.20	\$9.90	\$21.15	\$0.00	\$96.25
	08/01/2019	\$68.52	\$9.90	\$21.15	\$0.00	\$99.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER	08/01/2017	\$44.27	\$9.90	\$21.15	\$0.00	\$75.32
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2018	\$46.57	\$9.90	\$21.15	\$0.00	\$77.62
	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT)	08/01/2017	\$66.41	\$9.90	\$21.15	\$0.00	\$97.46
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2018	\$69.86	\$9.90	\$21.15	\$0.00	\$100.91
	08/01/2019	\$73.41	\$9.90	\$21.15	\$0.00	\$104.46
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT)	08/01/2017	\$92.97	\$9.90	\$21.15	\$0.00	\$124.02
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2018	\$97.80	\$9.90	\$21.15	\$0.00	\$128.85
	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction)	03/01/2018	\$50.15	\$13.00	\$17.85	\$0.00	\$81.00
ELECTRICIANS LOCAL 103	09/01/2018	\$51.34	\$13.00	\$17.89	\$0.00	\$82.23
	03/01/2019	\$52.53	\$13.00	\$17.93	\$0.00	\$83.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN	03/01/2018	\$50.15	\$13.00	\$17.85	\$0.00	\$81.00
ELECTRICIANS LOCAL 103	09/01/2018	\$51.34	\$13.00	\$17.89	\$0.00	\$82.23
	03/01/2019	\$52.53	\$13.00	\$17.93	\$0.00	\$83.46

**Classification**
**Effective Date**
**Base Wage**
**Health**
**Pension**
**Supplemental  
Unemployment**
**Total Rate**
**Apprentice - ELECTRICIAN - Local 103**
**Effective Date - 03/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$20.06	\$13.00	\$0.60	\$0.00	\$33.66
2	40	\$20.06	\$13.00	\$0.60	\$0.00	\$33.66
3	45	\$22.57	\$13.00	\$13.61	\$0.00	\$49.18
4	45	\$22.57	\$13.00	\$13.61	\$0.00	\$49.18
5	50	\$25.08	\$13.00	\$13.99	\$0.00	\$52.07
6	55	\$27.58	\$13.00	\$14.38	\$0.00	\$54.96
7	60	\$30.09	\$13.00	\$14.76	\$0.00	\$57.85
8	65	\$32.60	\$13.00	\$15.15	\$0.00	\$60.75
9	70	\$35.11	\$13.00	\$15.53	\$0.00	\$63.64
10	75	\$37.61	\$13.00	\$15.93	\$0.00	\$66.54

**Effective Date - 09/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$20.54	\$13.00	\$0.62	\$0.00	\$34.16
2	40	\$20.54	\$13.00	\$0.62	\$0.00	\$34.16
3	45	\$23.10	\$13.00	\$13.62	\$0.00	\$49.72
4	45	\$23.10	\$13.00	\$13.62	\$0.00	\$49.72
5	50	\$25.67	\$13.00	\$14.01	\$0.00	\$52.68
6	55	\$28.24	\$13.00	\$14.40	\$0.00	\$55.64
7	60	\$30.80	\$13.00	\$14.78	\$0.00	\$58.58
8	65	\$33.37	\$13.00	\$15.17	\$0.00	\$61.54
9	70	\$35.94	\$13.00	\$15.56	\$0.00	\$64.50
10	75	\$38.51	\$13.00	\$15.96	\$0.00	\$67.47

**Notes: :**

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

**Apprentice to Journeyworker Ratio:2:3\*\*\***

 ELEVATOR CONSTRUCTOR  
 ELEVATOR CONSTRUCTORS LOCAL 4

01/01/2017

\$55.86

\$15.28

\$15.71

\$0.00

\$86.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - ELEVATOR CONSTRUCTOR - Local 4**

**Effective Date -** 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$27.93	\$15.28	\$0.00	\$0.00	\$43.21
2	55	\$30.72	\$15.28	\$15.71	\$0.00	\$61.71
3	65	\$36.31	\$15.28	\$15.71	\$0.00	\$67.30
4	70	\$39.10	\$15.28	\$15.71	\$0.00	\$70.09
5	80	\$44.69	\$15.28	\$15.71	\$0.00	\$75.68

**Notes:**

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

**Apprentice to Journeyworker Ratio:1:1**

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2017	\$39.10	\$15.28	\$15.71	\$0.00	\$70.09
For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"						
FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2017	\$42.88	\$10.00	\$15.25	\$0.00	\$68.13
	05/01/2018	\$43.59	\$10.00	\$15.25	\$0.00	\$68.84
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2017	\$44.34	\$10.00	\$15.25	\$0.00	\$69.59
	05/01/2018	\$45.06	\$10.00	\$15.25	\$0.00	\$70.31
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2017	\$22.83	\$10.00	\$15.25	\$0.00	\$48.08
	05/01/2018	\$23.26	\$10.00	\$15.25	\$0.00	\$48.51
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2018	\$50.15	\$13.00	\$17.85	\$0.00	\$81.00
	09/01/2018	\$51.34	\$13.00	\$17.89	\$0.00	\$82.23
	03/01/2019	\$52.53	\$13.00	\$17.93	\$0.00	\$83.46
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING <i>ELECTRICIANS LOCAL 103</i>	03/01/2018	\$37.61	\$13.00	\$15.93	\$0.00	\$66.54
	09/01/2018	\$38.51	\$13.00	\$15.96	\$0.00	\$67.47
	03/01/2019	\$39.40	\$13.00	\$15.98	\$0.00	\$68.38
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$38.57	\$10.50	\$15.50	\$0.00	\$64.57
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FLAGGER & SIGNALER <i>LABORERS - ZONE 1</i>	12/01/2017	\$21.50	\$7.70	\$14.75	\$0.00	\$43.95
	06/01/2018	\$21.50	\$7.70	\$14.75	\$0.00	\$43.95
	12/01/2018	\$22.50	\$7.70	\$14.75	\$0.00	\$44.95
	06/01/2019	\$22.50	\$7.70	\$14.75	\$0.00	\$44.95
	12/01/2019	\$23.50	\$7.70	\$14.75	\$0.00	\$45.95
	06/01/2020	\$23.50	\$7.70	\$14.75	\$0.00	\$45.95
	12/01/2020	\$24.50	\$7.70	\$14.75	\$0.00	\$46.95
	06/01/2021	\$24.50	\$7.70	\$14.75	\$0.00	\$46.95
	12/01/2021	\$24.50	\$7.70	\$14.75	\$0.00	\$46.95
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE 1</i>	03/01/2016	\$42.13	\$9.80	\$17.62	\$0.00	\$69.55

**Apprentice - FLOORCOVERER - Local 2168 Zone 1**

**Effective Date -** 03/01/2016

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.07	\$9.80	\$1.79	\$0.00	\$32.66
2	55	\$23.17	\$9.80	\$1.79	\$0.00	\$34.76
3	60	\$25.28	\$9.80	\$12.25	\$0.00	\$47.33
4	65	\$27.38	\$9.80	\$12.25	\$0.00	\$49.43
5	70	\$29.49	\$9.80	\$14.04	\$0.00	\$53.33
6	75	\$31.60	\$9.80	\$14.04	\$0.00	\$55.44
7	80	\$33.70	\$9.80	\$15.83	\$0.00	\$59.33
8	85	\$35.81	\$9.80	\$15.83	\$0.00	\$61.44

**Notes:** Steps are 750 hrs.  
 % After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)  
 Step 1&2 \$30.55/ 3&4 \$36.49/ 5&6 \$53.33/ 7&8 \$59.33

**Apprentice to Journeyworker Ratio:1:1**

FORK LIFT/CHERRY PICKER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.63	\$10.50	\$15.50	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$31.80	\$10.50	\$15.50	\$0.00	\$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) <i>GLAZIERS LOCAL 35 (ZONE 2)</i>	01/01/2017	\$40.91	\$7.85	\$16.10	\$0.00	\$64.86

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - GLAZIER - Local 35 Zone 2**

**Effective Date -** 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.46	\$7.85	\$0.00	\$0.00	\$28.31
2	55	\$22.50	\$7.85	\$3.66	\$0.00	\$34.01
3	60	\$24.55	\$7.85	\$3.99	\$0.00	\$36.39
4	65	\$26.59	\$7.85	\$4.32	\$0.00	\$38.76
5	70	\$28.64	\$7.85	\$14.11	\$0.00	\$50.60
6	75	\$30.68	\$7.85	\$14.44	\$0.00	\$52.97
7	80	\$32.73	\$7.85	\$14.77	\$0.00	\$55.35
8	90	\$36.82	\$7.85	\$15.44	\$0.00	\$60.11

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

HOISTING ENGINEER/CRANES/GRADALLS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.63	\$10.50	\$15.50	\$0.00	\$72.63
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**Apprentice - OPERATING ENGINEERS - Local 4**

**Effective Date -** 12/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$25.65	\$10.50	\$0.00	\$0.00	\$36.15
2	60	\$27.98	\$10.50	\$15.50	\$0.00	\$53.98
3	65	\$30.31	\$10.50	\$15.50	\$0.00	\$56.31
4	70	\$32.64	\$10.50	\$15.50	\$0.00	\$58.64
5	75	\$34.97	\$10.50	\$15.50	\$0.00	\$60.97
6	80	\$37.30	\$10.50	\$15.50	\$0.00	\$63.30
7	85	\$39.64	\$10.50	\$15.50	\$0.00	\$65.64
8	90	\$41.97	\$10.50	\$15.50	\$0.00	\$67.97

**Notes:**

**Apprentice to Journeyworker Ratio:1:6**

HVAC (DUCTWORK) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2018	\$44.11	\$12.20	\$24.12	\$2.41	\$82.84
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For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) <i>ELECTRICIANS LOCAL 103</i>	03/01/2018	\$50.15	\$13.00	\$17.85	\$0.00	\$81.00
	09/01/2018	\$51.34	\$13.00	\$17.89	\$0.00	\$82.23
	03/01/2019	\$52.53	\$13.00	\$17.93	\$0.00	\$83.46

For apprentice rates see "Apprentice- ELECTRICIAN"

HVAC (TESTING AND BALANCING - AIR) <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2018	\$44.11	\$12.20	\$24.12	\$2.41	\$82.84
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For apprentice rates see "Apprentice- SHEET METAL WORKER"



Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER) <i>PIPEFITTERS LOCAL 537</i>	03/01/2017	\$51.19	\$9.70	\$18.14	\$0.00	\$79.03
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC <i>PIPEFITTERS LOCAL 537</i>	03/01/2017	\$51.19	\$9.70	\$18.14	\$0.00	\$79.03
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 1</i>	12/01/2017	\$38.25	\$7.70	\$14.75	\$0.00	\$60.70
	06/01/2018	\$39.20	\$7.70	\$14.75	\$0.00	\$61.65
	12/01/2018	\$40.15	\$7.70	\$14.75	\$0.00	\$62.60
	06/01/2019	\$41.15	\$7.70	\$14.75	\$0.00	\$63.60
	12/01/2019	\$42.15	\$7.70	\$14.75	\$0.00	\$64.60
	06/01/2020	\$43.14	\$7.70	\$14.75	\$0.00	\$65.59
	12/01/2020	\$44.12	\$7.70	\$14.75	\$0.00	\$66.57
	06/01/2021	\$45.14	\$7.70	\$14.75	\$0.00	\$67.59
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) <i>HEAT &amp; FROST INSULATORS LOCAL 6 (BOSTON)</i>	09/01/2017	\$47.09	\$11.75	\$14.20	\$0.00	\$73.04
	09/01/2018	\$49.34	\$11.75	\$14.20	\$0.00	\$75.29
	09/01/2019	\$51.84	\$11.75	\$14.20	\$0.00	\$77.79

**Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston**

**Effective Date -** 09/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.55	\$11.75	\$10.45	\$0.00	\$45.75
2	60	\$28.25	\$11.75	\$11.20	\$0.00	\$51.20
3	70	\$32.96	\$11.75	\$11.95	\$0.00	\$56.66
4	80	\$37.67	\$11.75	\$12.70	\$0.00	\$62.12

**Effective Date -** 09/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.67	\$11.75	\$10.45	\$0.00	\$46.87
2	60	\$29.60	\$11.75	\$11.20	\$0.00	\$52.55
3	70	\$34.54	\$11.75	\$11.95	\$0.00	\$58.24
4	80	\$39.47	\$11.75	\$12.70	\$0.00	\$63.92

**Notes:**

Steps are 1 year

**Apprentice to Journeyworker Ratio:1:4**

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 7 (BOSTON AREA)</i>	03/16/2017	\$44.65	\$7.80	\$20.85	\$0.00	\$73.30
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**Classification**

**Effective Date   Base Wage   Health   Pension   Supplemental  
Unemployment   Total Rate**

**Apprentice - IRONWORKER - Local 7 Boston**

**Effective Date - 03/16/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$26.79	\$7.80	\$20.85	\$0.00	\$55.44
2	70	\$31.26	\$7.80	\$20.85	\$0.00	\$59.91
3	75	\$33.49	\$7.80	\$20.85	\$0.00	\$62.14
4	80	\$35.72	\$7.80	\$20.85	\$0.00	\$64.37
5	85	\$37.95	\$7.80	\$20.85	\$0.00	\$66.60
6	90	\$40.19	\$7.80	\$20.85	\$0.00	\$68.84

**Notes:**

\*\* Structural 1:6; Ornamental 1:4

**Apprentice to Journeyworker Ratio:\*\***

JACKHAMMER & PAVING BREAKER OPERATOR	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
LABORERS - ZONE 1	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

LABORER	12/01/2017	\$37.50	\$7.70	\$14.75	\$0.00	\$59.95
LABORERS - ZONE 1	06/01/2018	\$38.45	\$7.70	\$14.75	\$0.00	\$60.90
	12/01/2018	\$39.40	\$7.70	\$14.75	\$0.00	\$61.85
	06/01/2019	\$40.40	\$7.70	\$14.75	\$0.00	\$62.85
	12/01/2019	\$41.40	\$7.70	\$14.75	\$0.00	\$63.85
	06/01/2020	\$42.39	\$7.70	\$14.75	\$0.00	\$64.84
	12/01/2020	\$43.37	\$7.70	\$14.75	\$0.00	\$65.82
	06/01/2021	\$44.39	\$7.70	\$14.75	\$0.00	\$66.84
	12/01/2021	\$45.40	\$7.70	\$14.75	\$0.00	\$67.85

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - LABORER - Zone 1**

**Effective Date - 12/01/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$22.50	\$7.70	\$14.75	\$0.00	\$44.95
2	70	\$26.25	\$7.70	\$14.75	\$0.00	\$48.70
3	80	\$30.00	\$7.70	\$14.75	\$0.00	\$52.45
4	90	\$33.75	\$7.70	\$14.75	\$0.00	\$56.20

**Effective Date - 06/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.07	\$7.70	\$14.75	\$0.00	\$45.52
2	70	\$26.92	\$7.70	\$14.75	\$0.00	\$49.37
3	80	\$30.76	\$7.70	\$14.75	\$0.00	\$53.21
4	90	\$34.61	\$7.70	\$14.75	\$0.00	\$57.06

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

LABORER: CARPENTER TENDER LABORERS - ZONE 1	12/01/2017	\$37.50	\$7.70	\$14.75	\$0.00	\$59.95
	06/01/2018	\$38.45	\$7.70	\$14.75	\$0.00	\$60.90
	12/01/2018	\$39.40	\$7.70	\$14.75	\$0.00	\$61.85
	06/01/2019	\$40.40	\$7.70	\$14.75	\$0.00	\$62.85
	12/01/2019	\$41.40	\$7.70	\$14.75	\$0.00	\$63.85
	06/01/2020	\$42.39	\$7.70	\$14.75	\$0.00	\$64.84
	12/01/2020	\$43.37	\$7.70	\$14.75	\$0.00	\$65.82
	06/01/2021	\$44.39	\$7.70	\$14.75	\$0.00	\$66.84
	12/01/2021	\$45.40	\$7.70	\$14.75	\$0.00	\$67.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER LABORERS - ZONE 1	12/01/2017	\$37.50	\$7.70	\$14.75	\$0.00	\$59.95
	06/01/2018	\$38.45	\$7.70	\$14.75	\$0.00	\$60.90
	12/01/2018	\$39.40	\$7.70	\$14.75	\$0.00	\$61.85
	06/01/2019	\$40.40	\$7.70	\$14.75	\$0.00	\$62.85
	12/01/2019	\$41.40	\$7.70	\$14.75	\$0.00	\$63.85
	06/01/2020	\$42.39	\$7.70	\$14.75	\$0.00	\$64.84
	12/01/2020	\$43.37	\$7.70	\$14.75	\$0.00	\$65.82
	06/01/2021	\$44.39	\$7.70	\$14.75	\$0.00	\$66.84
	12/01/2021	\$45.40	\$7.70	\$14.75	\$0.00	\$67.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS - ZONE 1	12/01/2017	\$37.65	\$7.70	\$14.75	\$0.00	\$60.10
	06/01/2018	\$38.60	\$7.70	\$14.75	\$0.00	\$61.05
	12/01/2018	\$39.55	\$7.70	\$14.75	\$0.00	\$62.00
	06/01/2019	\$40.55	\$7.70	\$14.75	\$0.00	\$63.00
	12/01/2019	\$41.55	\$7.70	\$14.75	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.50	\$7.70	\$14.75	\$0.00	\$59.95
	06/01/2018	\$38.45	\$7.70	\$14.75	\$0.00	\$60.90
	12/01/2018	\$39.40	\$7.70	\$14.75	\$0.00	\$61.85
	06/01/2019	\$40.40	\$7.70	\$14.75	\$0.00	\$62.85
	12/01/2019	\$41.40	\$7.70	\$14.75	\$0.00	\$63.85
	06/01/2020	\$42.39	\$7.70	\$14.75	\$0.00	\$64.84
	12/01/2020	\$43.37	\$7.70	\$14.75	\$0.00	\$65.82
	06/01/2021	\$44.39	\$7.70	\$14.75	\$0.00	\$66.84
	12/01/2021	\$45.40	\$7.70	\$14.75	\$0.00	\$67.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.50	\$7.70	\$14.75	\$0.00	\$59.95
	06/01/2018	\$38.45	\$7.70	\$14.75	\$0.00	\$60.90
	12/01/2018	\$39.40	\$7.70	\$14.75	\$0.00	\$61.85
	06/01/2019	\$40.40	\$7.70	\$14.75	\$0.00	\$62.85
	12/01/2019	\$41.40	\$7.70	\$14.75	\$0.00	\$63.85
	06/01/2020	\$42.39	\$7.70	\$14.75	\$0.00	\$64.84
	12/01/2020	\$43.37	\$7.70	\$14.75	\$0.00	\$65.82
	06/01/2021	\$44.39	\$7.70	\$14.75	\$0.00	\$66.84
	12/01/2021	\$45.40	\$7.70	\$14.75	\$0.00	\$67.85
This classification applies to all tree work associated with the removal of standing trees, and trimming and removal of branches and limbs when the work is not done for a utility company for the purpose of operation, maintenance or repair of utility company equipment. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i>	02/01/2018	\$39.82	\$10.75	\$18.34	\$0.00	\$68.91
	08/01/2018	\$40.90	\$10.75	\$18.47	\$0.00	\$70.12
	02/01/2019	\$41.41	\$10.75	\$18.47	\$0.00	\$70.63
	08/01/2019	\$42.49	\$10.75	\$18.61	\$0.00	\$71.85
	02/01/2020	\$43.00	\$10.75	\$18.61	\$0.00	\$72.36
	08/01/2020	\$44.08	\$10.75	\$18.76	\$0.00	\$73.59
	02/01/2021	\$44.59	\$10.75	\$18.76	\$0.00	\$74.10
	08/01/2021	\$45.71	\$10.75	\$18.92	\$0.00	\$75.38
	02/01/2022	\$46.18	\$10.75	\$18.92	\$0.00	\$75.85

**Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile**

**Effective Date -** 02/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.91	\$10.75	\$18.34	\$0.00	\$49.00
2	60	\$23.89	\$10.75	\$18.34	\$0.00	\$52.98
3	70	\$27.87	\$10.75	\$18.34	\$0.00	\$56.96
4	80	\$31.86	\$10.75	\$18.34	\$0.00	\$60.95
5	90	\$35.84	\$10.75	\$18.34	\$0.00	\$64.93

**Effective Date -** 08/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.45	\$10.75	\$18.47	\$0.00	\$49.67
2	60	\$24.54	\$10.75	\$18.47	\$0.00	\$53.76
3	70	\$28.63	\$10.75	\$18.47	\$0.00	\$57.85
4	80	\$32.72	\$10.75	\$18.47	\$0.00	\$61.94
5	90	\$36.81	\$10.75	\$18.47	\$0.00	\$66.03

**Notes:**

**Apprentice to Journeyworker Ratio:1:3**

MARBLE MASONS, TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i>	02/01/2018	\$52.10	\$10.75	\$20.03	\$0.00	\$82.88
	08/01/2018	\$53.45	\$10.75	\$20.16	\$0.00	\$84.36
	02/01/2019	\$54.07	\$10.75	\$20.16	\$0.00	\$84.98
	08/01/2019	\$55.42	\$10.75	\$20.30	\$0.00	\$86.47
	02/01/2020	\$56.05	\$10.75	\$20.30	\$0.00	\$87.10
	08/01/2020	\$57.40	\$10.75	\$20.45	\$0.00	\$88.60
	02/01/2021	\$58.04	\$10.75	\$20.45	\$0.00	\$89.24
	08/01/2021	\$59.44	\$10.75	\$20.61	\$0.00	\$90.80
	02/01/2022	\$60.01	\$10.75	\$20.61	\$0.00	\$91.37

**Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile**

**Effective Date -** 02/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.05	\$10.75	\$20.03	\$0.00	\$56.83
2	60	\$31.26	\$10.75	\$20.03	\$0.00	\$62.04
3	70	\$36.47	\$10.75	\$20.03	\$0.00	\$67.25
4	80	\$41.68	\$10.75	\$20.03	\$0.00	\$72.46
5	90	\$46.89	\$10.75	\$20.03	\$0.00	\$77.67

**Effective Date -** 08/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.73	\$10.75	\$20.16	\$0.00	\$57.64
2	60	\$32.07	\$10.75	\$20.16	\$0.00	\$62.98
3	70	\$37.42	\$10.75	\$20.16	\$0.00	\$68.33
4	80	\$42.76	\$10.75	\$20.16	\$0.00	\$73.67
5	90	\$48.11	\$10.75	\$20.16	\$0.00	\$79.02

**Notes:**

**Apprentice to Journeyworker Ratio:1:5**

MECH. SWEEPER OPERATOR (ON CONST. SITES) OPERATING ENGINEERS LOCAL 4	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE OPERATING ENGINEERS LOCAL 4	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) MILLWRIGHTS LOCAL 1121 - Zone 1	10/01/2017	\$39.52	\$9.90	\$18.50	\$0.00	\$67.92
	04/01/2018	\$40.42	\$9.90	\$18.50	\$0.00	\$68.82
	10/01/2018	\$41.32	\$9.90	\$18.50	\$0.00	\$69.72
	04/01/2019	\$42.22	\$9.90	\$18.50	\$0.00	\$70.62

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - MILLWRIGHT - Local 1121 Zone 1**

**Effective Date -** 10/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$21.74	\$9.90	\$5.31	\$0.00	\$36.95
2	65	\$25.69	\$9.90	\$15.13	\$0.00	\$50.72
3	75	\$29.64	\$9.90	\$16.10	\$0.00	\$55.64
4	85	\$33.59	\$9.90	\$17.06	\$0.00	\$60.55

**Effective Date -** 04/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$22.23	\$9.90	\$5.31	\$0.00	\$37.44
2	65	\$26.27	\$9.90	\$15.13	\$0.00	\$51.30
3	75	\$30.32	\$9.90	\$16.10	\$0.00	\$56.32
4	85	\$34.36	\$9.90	\$17.06	\$0.00	\$61.32

**Notes:**

Steps are 2,000 hours

**Apprentice to Journeyworker Ratio:1:5**

MORTAR MIXER LABORERS - ZONE 1	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) OPERATING ENGINEERS LOCAL 4	12/01/2017	\$23.24	\$10.50	\$15.50	\$0.00	\$49.24
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) OPERATING ENGINEERS LOCAL 4	12/01/2017	\$27.40	\$10.50	\$15.50	\$0.00	\$53.40
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II OPERATING ENGINEERS LOCAL 4	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) PAINTERS LOCAL 35 - ZONE 2	01/01/2017	\$51.41	\$7.85	\$16.10	\$0.00	\$75.36

**Apprentice - PAINTER Local 35 - BRIDGES/TANKS****Effective Date -** 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.71	\$7.85	\$0.00	\$0.00	\$33.56
2	55	\$28.28	\$7.85	\$3.66	\$0.00	\$39.79
3	60	\$30.85	\$7.85	\$3.99	\$0.00	\$42.69
4	65	\$33.42	\$7.85	\$4.32	\$0.00	\$45.59
5	70	\$35.99	\$7.85	\$14.11	\$0.00	\$57.95
6	75	\$38.56	\$7.85	\$14.44	\$0.00	\$60.85
7	80	\$41.13	\$7.85	\$14.77	\$0.00	\$63.75
8	90	\$46.27	\$7.85	\$15.44	\$0.00	\$69.56

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (SPRAY OR SANDBLAST, NEW) \*

01/01/2017

\$42.31

\$7.85

\$16.10

\$0.00

\$66.26

\* If 30% or more of surfaces to be painted are new construction,

NEW paint rate shall be used. *PAINTERS LOCAL 35 - ZONE 2***Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New****Effective Date -** 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.16	\$7.85	\$0.00	\$0.00	\$29.01
2	55	\$23.27	\$7.85	\$3.66	\$0.00	\$34.78
3	60	\$25.39	\$7.85	\$3.99	\$0.00	\$37.23
4	65	\$27.50	\$7.85	\$4.32	\$0.00	\$39.67
5	70	\$29.62	\$7.85	\$14.11	\$0.00	\$51.58
6	75	\$31.73	\$7.85	\$14.44	\$0.00	\$54.02
7	80	\$33.85	\$7.85	\$14.77	\$0.00	\$56.47
8	90	\$38.08	\$7.85	\$15.44	\$0.00	\$61.37

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (SPRAY OR SANDBLAST, REPAINT)

01/01/2017

\$40.37

\$7.85

\$16.10

\$0.00

\$64.32

*PAINTERS LOCAL 35 - ZONE 2*



**Classification**
**Effective Date**
**Base Wage**
**Health**
**Pension**
**Supplemental  
Unemployment**
**Total Rate**
**Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint**
**Effective Date - 01/01/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.19	\$7.85	\$0.00	\$0.00	\$28.04
2	55	\$22.20	\$7.85	\$3.66	\$0.00	\$33.71
3	60	\$24.22	\$7.85	\$3.99	\$0.00	\$36.06
4	65	\$26.24	\$7.85	\$4.32	\$0.00	\$38.41
5	70	\$28.26	\$7.85	\$14.11	\$0.00	\$50.22
6	75	\$30.28	\$7.85	\$14.44	\$0.00	\$52.57
7	80	\$32.30	\$7.85	\$14.77	\$0.00	\$54.92
8	90	\$36.33	\$7.85	\$15.44	\$0.00	\$59.62

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER (TRAFFIC MARKINGS)	12/01/2017	\$37.50	\$7.70	\$14.75	\$0.00	\$59.95
LABORERS - ZONE 1	06/01/2018	\$38.45	\$7.70	\$14.75	\$0.00	\$60.90
	12/01/2018	\$39.40	\$7.70	\$14.75	\$0.00	\$61.85
	06/01/2019	\$40.40	\$7.70	\$14.75	\$0.00	\$62.85
	12/01/2019	\$41.40	\$7.70	\$14.75	\$0.00	\$63.85
	06/01/2020	\$42.39	\$7.70	\$14.75	\$0.00	\$64.84
	12/01/2020	\$43.37	\$7.70	\$14.75	\$0.00	\$65.82
	06/01/2021	\$44.39	\$7.70	\$14.75	\$0.00	\$66.84
	12/01/2021	\$45.40	\$7.70	\$14.75	\$0.00	\$67.85

For Apprentice rates see "Apprentice- LABORER"

PAINTER / TAPER (BRUSH, NEW) *	01/01/2017	\$40.91	\$7.85	\$16.10	\$0.00	\$64.86
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\* If 30% or more of surfaces to be painted are new construction,  
NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW**

**Effective Date -** 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.46	\$7.85	\$0.00	\$0.00	\$28.31
2	55	\$22.50	\$7.85	\$3.66	\$0.00	\$34.01
3	60	\$24.55	\$7.85	\$3.99	\$0.00	\$36.39
4	65	\$26.59	\$7.85	\$4.32	\$0.00	\$38.76
5	70	\$28.64	\$7.85	\$14.11	\$0.00	\$50.60
6	75	\$30.68	\$7.85	\$14.44	\$0.00	\$52.97
7	80	\$32.73	\$7.85	\$14.77	\$0.00	\$55.35
8	90	\$36.82	\$7.85	\$15.44	\$0.00	\$60.11

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PAINTER / TAPER (BRUSH, REPAINT)	01/01/2017	\$38.97	\$7.85	\$16.10	\$0.00	\$62.92
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PAINTERS LOCAL 35 - ZONE 2

**Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT**

**Effective Date -** 01/01/2017

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.49	\$7.85	\$0.00	\$0.00	\$27.34
2	55	\$21.43	\$7.85	\$3.66	\$0.00	\$32.94
3	60	\$23.38	\$7.85	\$3.99	\$0.00	\$35.22
4	65	\$25.33	\$7.85	\$4.32	\$0.00	\$37.50
5	70	\$27.28	\$7.85	\$14.11	\$0.00	\$49.24
6	75	\$29.23	\$7.85	\$14.44	\$0.00	\$51.52
7	80	\$31.18	\$7.85	\$14.77	\$0.00	\$53.80
8	90	\$35.07	\$7.85	\$15.44	\$0.00	\$58.36

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

PANEL & PICKUP TRUCKS DRIVER	12/01/2016	\$33.08	\$10.91	\$10.89	\$0.00	\$54.88
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TEAMSTERS JOINT COUNCIL NO. 10 ZONE A

PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)	08/01/2017	\$44.27	\$9.90	\$21.15	\$0.00	\$75.32
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2018	\$46.57	\$9.90	\$21.15	\$0.00	\$77.62
	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99

For apprentice rates see "Apprentice- PILE DRIVER"

PILE DRIVER	08/01/2017	\$44.27	\$9.90	\$21.15	\$0.00	\$75.32
PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2018	\$46.57	\$9.90	\$21.15	\$0.00	\$77.62
	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99

**Apprentice - PILE DRIVER - Local 56 Zone 1****Effective Date - 08/01/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.14	\$9.90	\$21.15	\$0.00	\$53.19
2	60	\$26.56	\$9.90	\$21.15	\$0.00	\$57.61
3	70	\$30.99	\$9.90	\$21.15	\$0.00	\$62.04
4	75	\$33.20	\$9.90	\$21.15	\$0.00	\$64.25
5	80	\$35.42	\$9.90	\$21.15	\$0.00	\$66.47
6	80	\$35.42	\$9.90	\$21.15	\$0.00	\$66.47
7	90	\$39.84	\$9.90	\$21.15	\$0.00	\$70.89
8	90	\$39.84	\$9.90	\$21.15	\$0.00	\$70.89

**Effective Date - 08/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.29	\$9.90	\$21.15	\$0.00	\$54.34
2	60	\$27.94	\$9.90	\$21.15	\$0.00	\$58.99
3	70	\$32.60	\$9.90	\$21.15	\$0.00	\$63.65
4	75	\$34.93	\$9.90	\$21.15	\$0.00	\$65.98
5	80	\$37.26	\$9.90	\$21.15	\$0.00	\$68.31
6	80	\$37.26	\$9.90	\$21.15	\$0.00	\$68.31
7	90	\$41.91	\$9.90	\$21.15	\$0.00	\$72.96
8	90	\$41.91	\$9.90	\$21.15	\$0.00	\$72.96

**Notes:****Apprentice to Journeyworker Ratio:1:5**

PIPEFITTER &amp; STEAMFITTER

03/01/2017

\$51.19

\$9.70

\$18.14

\$0.00

\$79.03

PIPEFITTERS LOCAL 537

**Apprentice - PIPEFITTER - Local 537****Effective Date - 03/01/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$20.48	\$9.70	\$7.50	\$0.00	\$37.68
2	45	\$23.04	\$9.70	\$18.14	\$0.00	\$50.88
3	60	\$30.71	\$9.70	\$18.14	\$0.00	\$58.55
4	70	\$35.83	\$9.70	\$18.14	\$0.00	\$63.67
5	80	\$40.95	\$9.70	\$18.14	\$0.00	\$68.79

**Notes:**

\*\* 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.

Refrig/AC Mechanic \*\*1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

**Apprentice to Journeyworker Ratio:\*\***

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10

For apprentice rates see "Apprentice- LABORER"

PLUMBERS & GASFITTERS <i>PLUMBERS &amp; GASFITTERS LOCAL 12</i>	03/01/2018	\$54.69	\$11.57	\$15.76	\$0.00	\$82.02
	09/01/2018	\$56.19	\$11.57	\$15.76	\$0.00	\$83.52
	03/01/2019	\$57.69	\$11.57	\$15.76	\$0.00	\$85.02
	09/01/2019	\$59.19	\$11.57	\$15.76	\$0.00	\$86.52
	03/01/2020	\$60.69	\$11.57	\$15.76	\$0.00	\$88.02
	09/01/2020	\$62.19	\$11.57	\$15.76	\$0.00	\$89.52
	03/01/2021	\$63.69	\$11.57	\$15.76	\$0.00	\$91.02

#### Apprentice - PLUMBER/GASFITTER - Local 12

Effective Date - 03/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$19.14	\$11.57	\$5.72	\$0.00	\$36.43
2	40	\$21.88	\$11.57	\$6.49	\$0.00	\$39.94
3	55	\$30.08	\$11.57	\$8.81	\$0.00	\$50.46
4	65	\$35.55	\$11.57	\$10.36	\$0.00	\$57.48
5	75	\$41.02	\$11.57	\$11.90	\$0.00	\$64.49

Effective Date - 09/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$19.67	\$11.57	\$5.72	\$0.00	\$36.96
2	40	\$22.48	\$11.57	\$6.49	\$0.00	\$40.54
3	55	\$30.90	\$11.57	\$8.82	\$0.00	\$51.29
4	65	\$36.52	\$11.57	\$10.36	\$0.00	\$58.45
5	75	\$42.14	\$11.57	\$11.90	\$0.00	\$65.61

#### Notes:

\*\* 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr  
Step4 with lic\$61.00, Step5 with lic\$67.99

Apprentice to Journeyworker Ratio:\*\*

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537</i>	03/01/2017	\$51.19	\$9.70	\$18.14	\$0.00	\$79.03
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For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER <i>LABORERS - ZONE 1</i>	12/01/2017	\$38.50	\$7.70	\$14.75	\$0.00	\$60.95
	06/01/2018	\$39.45	\$7.70	\$14.75	\$0.00	\$61.90
	12/01/2018	\$40.40	\$7.70	\$14.75	\$0.00	\$62.85
	06/01/2019	\$41.40	\$7.70	\$14.75	\$0.00	\$63.85
	12/01/2019	\$42.40	\$7.70	\$14.75	\$0.00	\$64.85
	06/01/2020	\$43.39	\$7.70	\$14.75	\$0.00	\$65.84
	12/01/2020	\$44.37	\$7.70	\$14.75	\$0.00	\$66.82
	06/01/2021	\$45.39	\$7.70	\$14.75	\$0.00	\$67.84
	12/01/2021	\$46.40	\$7.70	\$14.75	\$0.00	\$68.85
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.63	\$10.50	\$15.50	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.63	\$10.50	\$15.50	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$31.80	\$10.50	\$15.50	\$0.00	\$57.80
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY MIX CONCRETE DRIVERS after 4/30/10 (Drivers Hired After 4/30/2010) <i>TEAMSTERS LOCAL 25c</i>	07/01/2017	\$28.18	\$8.48	\$9.72	\$0.00	\$46.38
READY-MIX CONCRETE DRIVER <i>TEAMSTERS LOCAL 25c</i>	07/01/2017	\$29.48	\$8.48	\$9.72	\$0.00	\$47.68
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROOFER (Inc.Roofing Waterproofing &Roofing Damproofg) <i>ROOFERS LOCAL 33</i>	02/01/2018	\$42.36	\$11.35	\$14.80	\$0.00	\$68.51
	08/01/2018	\$43.46	\$11.35	\$14.80	\$0.00	\$69.61
	02/01/2019	\$44.61	\$11.35	\$14.80	\$0.00	\$70.76

**Apprentice - ROOFER - Local 33**

**Effective Date -** 02/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.18	\$11.35	\$3.44	\$0.00	\$35.97
2	60	\$25.42	\$11.35	\$14.80	\$0.00	\$51.57
3	65	\$27.53	\$11.35	\$14.80	\$0.00	\$53.68
4	75	\$31.77	\$11.35	\$14.80	\$0.00	\$57.92
5	85	\$36.01	\$11.35	\$14.80	\$0.00	\$62.16

**Effective Date -** 08/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.73	\$11.35	\$3.44	\$0.00	\$36.52
2	60	\$26.08	\$11.35	\$14.80	\$0.00	\$52.23
3	65	\$28.25	\$11.35	\$14.80	\$0.00	\$54.40
4	75	\$32.60	\$11.35	\$14.80	\$0.00	\$58.75
5	85	\$36.94	\$11.35	\$14.80	\$0.00	\$63.09

**Notes:** \*\* 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1  
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.  
(Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

**Apprentice to Journeyworker Ratio:\*\***

ROOFER SLATE / TILE / PRECAST CONCRETE <i>ROOFERS LOCAL 33</i>	02/01/2018	\$42.61	\$11.35	\$14.80	\$0.00	\$68.76
	08/01/2018	\$43.71	\$11.35	\$14.80	\$0.00	\$69.86
	02/01/2019	\$44.86	\$11.35	\$14.80	\$0.00	\$71.01
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2018	\$44.11	\$12.20	\$24.12	\$2.41	\$82.84

**Classification**
**Effective Date**
**Base Wage**
**Health**
**Pension**
**Supplemental  
Unemployment**
**Total Rate**
**Apprentice - SHEET METAL WORKER - Local 17-A**
**Effective Date - 02/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.64	\$12.20	\$5.61	\$0.00	\$35.45
2	40	\$17.64	\$12.20	\$5.61	\$0.00	\$35.45
3	45	\$19.85	\$12.20	\$10.85	\$1.29	\$44.19
4	45	\$19.85	\$12.20	\$10.85	\$1.29	\$44.19
5	50	\$22.06	\$12.20	\$11.80	\$1.38	\$47.44
6	50	\$22.06	\$12.20	\$12.05	\$1.39	\$47.70
7	60	\$26.47	\$12.20	\$13.70	\$1.57	\$53.94
8	65	\$28.67	\$12.20	\$14.65	\$1.67	\$57.19
9	75	\$33.08	\$12.20	\$16.56	\$1.86	\$63.70
10	85	\$37.49	\$12.20	\$17.96	\$2.03	\$69.68

**Notes:**

Steps are 6 mos.

**Apprentice to Journeyworker Ratio:1:4**

SIGN ERECTOR

PAINTERS LOCAL 35 - ZONE 2

06/01/2013

\$25.81

\$7.07

\$7.05

\$0.00

\$39.93

**Apprentice - SIGN ERECTOR - Local 35 Zone 2**
**Effective Date - 06/01/2013**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$12.91	\$7.07	\$0.00	\$0.00	\$19.98
2	55	\$14.20	\$7.07	\$2.45	\$0.00	\$23.72
3	60	\$15.49	\$7.07	\$2.45	\$0.00	\$25.01
4	65	\$16.78	\$7.07	\$2.45	\$0.00	\$26.30
5	70	\$18.07	\$7.07	\$7.05	\$0.00	\$32.19
6	75	\$19.36	\$7.07	\$7.05	\$0.00	\$33.48
7	80	\$20.65	\$7.07	\$7.05	\$0.00	\$34.77
8	85	\$21.94	\$7.07	\$7.05	\$0.00	\$36.06
9	90	\$23.23	\$7.07	\$7.05	\$0.00	\$37.35

**Notes:**

Steps are 4 mos.

**Apprentice to Journeyworker Ratio:1:1**

SPECIALIZED EARTH MOVING EQUIP &lt; 35 TONS

TEAMSTERS JOINT COUNCIL NO. 10 ZONE A

12/01/2016

\$33.54

\$10.91

\$10.89

\$0.00

\$55.34

SPECIALIZED EARTH MOVING EQUIP &gt; 35 TONS

TEAMSTERS JOINT COUNCIL NO. 10 ZONE A

12/01/2016

\$33.83

\$10.91

\$10.89

\$0.00

\$55.63

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPRINKLER FITTER	03/01/2018	\$57.78	\$9.12	\$18.15	\$0.00	\$85.05
<i>SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1</i>	10/01/2018	\$59.28	\$9.12	\$18.15	\$0.00	\$86.55
	01/01/2019	\$59.28	\$9.47	\$18.35	\$0.00	\$87.10
	03/01/2019	\$60.78	\$9.47	\$18.35	\$0.00	\$88.60
	10/01/2019	\$62.28	\$9.47	\$18.35	\$0.00	\$90.10
	03/01/2020	\$63.78	\$9.47	\$18.35	\$0.00	\$91.60
	10/01/2020	\$65.28	\$9.47	\$18.35	\$0.00	\$93.10
	03/01/2021	\$66.78	\$9.47	\$18.35	\$0.00	\$94.60

**Apprentice - SPRINKLER FITTER - Local 550 (Section A) Zone 1**

**Effective Date -** 03/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$20.22	\$9.12	\$8.90	\$0.00	\$38.24
2	40	\$23.11	\$9.12	\$8.90	\$0.00	\$41.13
3	45	\$26.00	\$9.12	\$8.90	\$0.00	\$44.02
4	50	\$28.89	\$9.12	\$8.90	\$0.00	\$46.91
5	55	\$31.78	\$9.12	\$8.90	\$0.00	\$49.80
6	60	\$34.67	\$9.12	\$10.40	\$0.00	\$54.19
7	65	\$37.56	\$9.12	\$10.40	\$0.00	\$57.08
8	70	\$40.45	\$9.12	\$10.40	\$0.00	\$59.97
9	75	\$43.34	\$9.12	\$10.40	\$0.00	\$62.86
10	80	\$46.22	\$9.12	\$10.40	\$0.00	\$65.74

**Effective Date -** 10/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$20.75	\$9.12	\$8.90	\$0.00	\$38.77
2	40	\$23.71	\$9.12	\$8.90	\$0.00	\$41.73
3	45	\$26.68	\$9.12	\$8.90	\$0.00	\$44.70
4	50	\$29.64	\$9.12	\$8.90	\$0.00	\$47.66
5	55	\$32.60	\$9.12	\$8.90	\$0.00	\$50.62
6	60	\$35.57	\$9.12	\$10.40	\$0.00	\$55.09
7	65	\$38.53	\$9.12	\$10.40	\$0.00	\$58.05
8	70	\$41.50	\$9.12	\$10.40	\$0.00	\$61.02
9	75	\$44.46	\$9.12	\$10.40	\$0.00	\$63.98
10	80	\$47.42	\$9.12	\$10.40	\$0.00	\$66.94

**Notes:** Apprentice entered prior 9/30/10;  
40/45/50/55/60/65/70/75/80/85  
Steps are 850 hours

**Apprentice to Journeyworker Ratio:1:3**

STEAM BOILER OPERATOR	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
<i>OPERATING ENGINEERS LOCAL 4</i>						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
<i>OPERATING ENGINEERS LOCAL 4</i>						
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						



Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN	03/01/2018	\$37.61	\$13.00	\$15.93	\$0.00	\$66.54
<i>ELECTRICIANS LOCAL 103</i>	09/01/2018	\$38.51	\$13.00	\$15.96	\$0.00	\$67.47
	03/01/2019	\$39.40	\$13.00	\$15.98	\$0.00	\$68.38

**Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103**

**Effective Date - 03/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$15.04	\$13.00	\$0.45	\$0.00	\$28.49
2	40	\$15.04	\$13.00	\$0.45	\$0.00	\$28.49
3	45	\$16.92	\$13.00	\$12.74	\$0.00	\$42.66
4	45	\$16.92	\$13.00	\$12.74	\$0.00	\$42.66
5	50	\$18.81	\$13.00	\$13.03	\$0.00	\$44.84
6	55	\$20.69	\$13.00	\$13.32	\$0.00	\$47.01
7	60	\$22.57	\$13.00	\$13.61	\$0.00	\$49.18
8	65	\$24.45	\$13.00	\$13.90	\$0.00	\$51.35
9	70	\$26.33	\$13.00	\$14.19	\$0.00	\$53.52
10	75	\$28.21	\$13.00	\$14.48	\$0.00	\$55.69

**Effective Date - 09/01/2018**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$15.40	\$13.00	\$0.46	\$0.00	\$28.86
2	40	\$15.40	\$13.00	\$0.46	\$0.00	\$28.86
3	45	\$17.33	\$13.00	\$12.75	\$0.00	\$43.08
4	45	\$17.33	\$13.00	\$12.75	\$0.00	\$43.08
5	50	\$19.26	\$13.00	\$13.05	\$0.00	\$45.31
6	55	\$21.18	\$13.00	\$13.34	\$0.00	\$47.52
7	60	\$23.11	\$13.00	\$13.62	\$0.00	\$49.73
8	65	\$25.03	\$13.00	\$13.92	\$0.00	\$51.95
9	70	\$26.96	\$13.00	\$14.21	\$0.00	\$54.17
10	75	\$28.88	\$13.00	\$14.50	\$0.00	\$56.38

**Notes:**

**Apprentice to Journeyworker Ratio:1:1**

TERRAZZO FINISHERS	02/01/2018	\$51.00	\$10.75	\$20.03	\$0.00	\$81.78
<i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i>	08/01/2018	\$52.35	\$10.75	\$20.16	\$0.00	\$83.26
	02/01/2019	\$52.99	\$10.75	\$20.16	\$0.00	\$83.90
	08/01/2019	\$54.34	\$10.75	\$20.30	\$0.00	\$85.39
	02/01/2020	\$54.98	\$10.75	\$20.30	\$0.00	\$86.03
	08/01/2020	\$56.33	\$10.75	\$20.45	\$0.00	\$87.53
	02/01/2021	\$56.97	\$10.75	\$20.45	\$0.00	\$88.17
	08/01/2021	\$58.37	\$10.75	\$20.61	\$0.00	\$89.73
	02/01/2022	\$58.96	\$10.75	\$20.61	\$0.00	\$90.32

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile**

**Effective Date -** 02/01/2018

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$25.50	\$10.75	\$20.03	\$0.00	\$56.28
2	60	\$30.60	\$10.75	\$20.03	\$0.00	\$61.38
3	70	\$35.70	\$10.75	\$20.03	\$0.00	\$66.48
4	80	\$40.80	\$10.75	\$20.03	\$0.00	\$71.58
5	90	\$45.90	\$10.75	\$20.03	\$0.00	\$76.68

**Notes:**

**Apprentice to Journeyworker Ratio:1:3**

TEST BORING DRILLER	12/01/2017	\$38.85	\$7.70	\$14.95	\$0.00	\$61.50
LABORERS - FOUNDATION AND MARINE	06/01/2018	\$39.80	\$7.70	\$14.95	\$0.00	\$62.45
	12/01/2018	\$40.75	\$7.70	\$14.95	\$0.00	\$63.40
	06/01/2019	\$41.75	\$7.70	\$14.95	\$0.00	\$64.40
	12/01/2019	\$42.75	\$7.70	\$14.95	\$0.00	\$65.40
	06/01/2020	\$43.74	\$7.70	\$14.95	\$0.00	\$66.39
	12/01/2020	\$44.72	\$7.70	\$14.95	\$0.00	\$67.37
	06/01/2021	\$45.74	\$7.70	\$14.95	\$0.00	\$68.39
	12/01/2021	\$46.75	\$7.70	\$14.95	\$0.00	\$69.40

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER	12/01/2017	\$37.57	\$7.70	\$14.95	\$0.00	\$60.22
LABORERS - FOUNDATION AND MARINE	06/01/2018	\$38.52	\$7.70	\$14.95	\$0.00	\$61.17
	12/01/2018	\$39.47	\$7.70	\$14.95	\$0.00	\$62.12
	06/01/2019	\$40.47	\$7.70	\$14.95	\$0.00	\$63.12
	12/01/2019	\$41.47	\$7.70	\$14.95	\$0.00	\$64.12
	06/01/2020	\$42.46	\$7.70	\$14.95	\$0.00	\$65.11
	12/01/2020	\$43.44	\$7.70	\$14.95	\$0.00	\$66.09
	06/01/2021	\$44.46	\$7.70	\$14.95	\$0.00	\$67.11
	12/01/2021	\$45.47	\$7.70	\$14.95	\$0.00	\$68.12

For apprentice rates see "Apprentice- LABORER"

TEST BORING LABORER	12/01/2017	\$37.45	\$7.70	\$14.95	\$0.00	\$60.10
LABORERS - FOUNDATION AND MARINE	06/01/2018	\$38.40	\$7.70	\$14.95	\$0.00	\$61.05
	12/01/2018	\$39.35	\$7.70	\$14.95	\$0.00	\$62.00
	06/01/2019	\$40.35	\$7.70	\$14.95	\$0.00	\$63.00
	12/01/2019	\$41.35	\$7.70	\$14.95	\$0.00	\$64.00
	06/01/2020	\$42.34	\$7.70	\$14.95	\$0.00	\$64.99
	12/01/2020	\$43.32	\$7.70	\$14.95	\$0.00	\$65.97
	06/01/2021	\$44.34	\$7.70	\$14.95	\$0.00	\$66.99
	12/01/2021	\$45.35	\$7.70	\$14.95	\$0.00	\$68.00

For apprentice rates see "Apprentice- LABORER"

TRACTORS/PORTABLE STEAM GENERATORS	12/01/2017	\$46.17	\$10.50	\$15.50	\$0.00	\$72.17
OPERATING ENGINEERS LOCAL 4						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2016	\$34.12	\$10.91	\$10.89	\$0.00	\$55.92
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>						
	12/01/2017	\$49.73	\$7.70	\$15.35	\$0.00	\$72.78
	06/01/2018	\$50.68	\$7.70	\$15.35	\$0.00	\$73.73
	12/01/2018	\$51.63	\$7.70	\$15.35	\$0.00	\$74.68
	06/01/2019	\$52.63	\$7.70	\$15.35	\$0.00	\$75.68
	12/01/2019	\$53.63	\$7.70	\$15.35	\$0.00	\$76.68
	06/01/2020	\$54.62	\$7.70	\$15.35	\$0.00	\$77.67
	12/01/2020	\$55.60	\$7.70	\$15.35	\$0.00	\$78.65
	06/01/2021	\$56.62	\$7.70	\$15.35	\$0.00	\$79.67
	12/01/2021	\$57.63	\$7.70	\$15.35	\$0.00	\$80.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	12/01/2017	\$51.73	\$7.70	\$15.35	\$0.00	\$74.78
	06/01/2018	\$52.68	\$7.70	\$15.35	\$0.00	\$75.73
	12/01/2018	\$53.63	\$7.70	\$15.35	\$0.00	\$76.68
	06/01/2019	\$54.63	\$7.70	\$15.35	\$0.00	\$77.68
	12/01/2019	\$55.63	\$7.70	\$15.35	\$0.00	\$78.68
	06/01/2020	\$56.62	\$7.70	\$15.35	\$0.00	\$79.67
	12/01/2020	\$57.60	\$7.70	\$15.35	\$0.00	\$80.65
	06/01/2021	\$58.62	\$7.70	\$15.35	\$0.00	\$81.67
	12/01/2021	\$59.63	\$7.70	\$15.35	\$0.00	\$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2017	\$41.80	\$7.70	\$15.35	\$0.00	\$64.85
	06/01/2018	\$42.75	\$7.70	\$15.35	\$0.00	\$65.80
	12/01/2018	\$43.70	\$7.70	\$15.35	\$0.00	\$66.75
	06/01/2019	\$44.70	\$7.70	\$15.35	\$0.00	\$67.75
	12/01/2019	\$45.70	\$7.70	\$15.35	\$0.00	\$68.75
	06/01/2020	\$46.69	\$7.70	\$15.35	\$0.00	\$69.74
	12/01/2020	\$47.67	\$7.70	\$15.35	\$0.00	\$70.72
	06/01/2021	\$48.69	\$7.70	\$15.35	\$0.00	\$71.74
	12/01/2021	\$49.70	\$7.70	\$15.35	\$0.00	\$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2017	\$43.80	\$7.70	\$15.35	\$0.00	\$66.85
	06/01/2018	\$44.75	\$7.70	\$15.35	\$0.00	\$67.80
	12/01/2018	\$45.70	\$7.70	\$15.35	\$0.00	\$68.75
	06/01/2019	\$46.70	\$7.70	\$15.35	\$0.00	\$69.75
	12/01/2019	\$47.70	\$7.70	\$15.35	\$0.00	\$70.75
	06/01/2020	\$48.69	\$7.70	\$15.35	\$0.00	\$71.74
	12/01/2020	\$49.67	\$7.70	\$15.35	\$0.00	\$72.72
	06/01/2021	\$50.69	\$7.70	\$15.35	\$0.00	\$73.74
	12/01/2021	\$51.70	\$7.70	\$15.35	\$0.00	\$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2016	\$33.54	\$10.91	\$10.89	\$0.00	\$55.34

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
WAGON DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2017	\$37.75	\$7.70	\$14.75	\$0.00	\$60.20
	06/01/2018	\$38.70	\$7.70	\$14.75	\$0.00	\$61.15
	12/01/2018	\$39.65	\$7.70	\$14.75	\$0.00	\$62.10
	06/01/2019	\$40.65	\$7.70	\$14.75	\$0.00	\$63.10
	12/01/2019	\$41.65	\$7.70	\$14.75	\$0.00	\$64.10
	06/01/2020	\$42.64	\$7.70	\$14.75	\$0.00	\$65.09
	12/01/2020	\$43.62	\$7.70	\$14.75	\$0.00	\$66.07
	06/01/2021	\$44.64	\$7.70	\$14.75	\$0.00	\$67.09
	12/01/2021	\$45.65	\$7.70	\$14.75	\$0.00	\$68.10
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2017	\$46.63	\$10.50	\$15.50	\$0.00	\$72.63
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS &amp; GASFITTERS LOCAL 12</i>	03/01/2018	\$54.69	\$11.57	\$15.76	\$0.00	\$82.02
	09/01/2018	\$56.19	\$11.57	\$15.76	\$0.00	\$83.52
	03/01/2019	\$57.69	\$11.57	\$15.76	\$0.00	\$85.02
	09/01/2019	\$59.19	\$11.57	\$15.76	\$0.00	\$86.52
	03/01/2020	\$60.69	\$11.57	\$15.76	\$0.00	\$88.02
	09/01/2020	\$62.19	\$11.57	\$15.76	\$0.00	\$89.52
	03/01/2021	\$63.69	\$11.57	\$15.76	\$0.00	\$91.02
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
<b>Outside Electrical - East</b>						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$27.14	\$7.75	\$1.81	\$0.00	\$36.70
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$38.45	\$7.75	\$9.53	\$0.00	\$55.73
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$31.66	\$7.75	\$9.44	\$0.00	\$48.85
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$24.88	\$7.75	\$1.75	\$0.00	\$34.38
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$38.45	\$7.75	\$13.61	\$0.00	\$59.81
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$33.92	\$7.75	\$10.21	\$0.00	\$51.88
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$24.88	\$7.75	\$1.75	\$0.00	\$34.38
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$20.35	\$7.75	\$1.61	\$0.00	\$29.71
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	09/03/2017	\$45.23	\$7.75	\$16.61	\$0.00	\$69.59

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
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**Apprentice - LINEMAN (Outside Electrical) - East Local 104**

**Effective Date - 09/03/2017**

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$27.14	\$7.75	\$3.31	\$0.00	\$38.20
2	65	\$29.40	\$7.75	\$3.38	\$0.00	\$40.53
3	70	\$31.66	\$7.75	\$3.45	\$0.00	\$42.86
4	75	\$33.92	\$7.75	\$5.02	\$0.00	\$46.69
5	80	\$36.18	\$7.75	\$5.09	\$0.00	\$49.02
6	85	\$38.45	\$7.75	\$5.15	\$0.00	\$51.35
7	90	\$40.71	\$7.75	\$7.22	\$0.00	\$55.68

**Notes:**

**Apprentice to Journeyworker Ratio:1:2**

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2016	\$28.98	\$4.25	\$3.12	\$0.00	\$36.35
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2016	\$27.31	\$4.25	\$3.07	\$0.00	\$34.63
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/01/2016	\$27.31	\$4.25	\$3.07	\$0.00	\$34.63
TREE TRIMMER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/31/2016	\$18.51	\$3.55	\$0.00	\$0.00	\$22.06
<p>This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground.</p> <p>This classification does not apply to wholesale tree removal.</p>						
TREE TRIMMER GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	01/31/2016	\$16.32	\$3.55	\$0.00	\$0.00	\$19.87
<p>This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.</p>						

**Additional Apprentice Information:**

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

\*\* Multiple ratios are listed in the comment field.

\*\*\* APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

\*\*\*\* APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

**BY-LAWS OF THE TOWN OF ARLINGTON**  
**TITLE 1**  
**ARTICLE 16: CONSTRUCTION PROJECTS**

ART. 15 ,A.T.M. 4/22/96

**Section 1. Women Work Force Participation**

Any Town board or official in charge of a construction or reconstruction project is required to include in the contract documents the following:

ART. 17, A.T.M. 4/28/99

A. The contractor shall maintain as a goal on this project a not less than five percent ratio of women work force to total project hours in both the general contract and individual filed sub-bid contract, if applicable. The preceding sentence shall be included in all construction contracts whether entered into the Town pursuant to the provisions of M.G.L. c.149 or M.G.L. c.30 §.39M, et seq., provided however, that if entered into under Chapter 30 same shall not be deemed to apply where the projected bid price as determined by the Director of Public Works is not likely to exceed \$200,000.

B. A Labor Scheduling Table which will be used as a tool for achieving a range of women work force participation for the entire project in both the general contract and each individual filed sub-bid contract.

**Section 2. Equal Opportunity Goal Compliance**

Any Town board or official in charge of a construction or reconstruction project is required to include in the contract documents the following:

ART. 16 A.T.M. 4/24/96; ART. 17, A.T.M. 4/28/99

A. Before starting work, the contractors (includes general contractor, for itself and its subcontractors, as well as all filed sub-bid contractors, if applicable) will submit plans for achievement of the equal opportunity goals of the contract. All contractors will be required to make a good faith effort to achieve these goals. The plan will indicate if the contractors expect to achieve the requirements during the first quarter. If there are reasons why the contractors do not expect to achieve the requirements during the first quarter year of the contract construction phase, then the contractors shall provide a plan calculated to address, to the extent reasonably possible, these obstacles to a good faith effort to achieve such goals.

B. Not more than ten days following the end of each work quarter, the contractors will report on the achievement of the goals, detailing the good faith efforts that have been made and will continue to be made and any other appropriate efforts not yet undertaken.

C. All reports will be signed by an officer or principal of the company who has the authority to contractually obligate the company.

**Section 3. Recruitment and Training**

ART. 53 ATM 5/19/97

Any board, officer, committee, or other agency of the Town, which acts on behalf of the Town in making or supervising any contract, in an amount exceeding the sum of \$100,000 for the purchase of goods or services or for the construction, renovation, or repair of buildings or other improvement of real estate, may make arrangements with contractors and other interested agencies for special programs of recruitment and training in connection with the work to be performed on such contract, with the objective of promoting equal employment opportunity for members of minority groups protected by the fair employment

laws of the Commonwealth and the United States. Any board, officer, committee or other Town agency may expend Town funds in carrying them out provided that appropriations specifically designed for such purposes have been voted by the Town Meeting.  
ART. 32, ATM 5/14/03

#### **Section 4. LEED**

It is the intent of the Town to reduce the life-cycle operating costs and increase the environmental efficiency of Town buildings, by adopting the goal that all construction of new Town buildings and major renovations and additions to existing Town buildings meet or exceed a Silver Certification based on the most current criteria of the Leadership in Energy and Environmental Design (LEED) Green Building Rating System promulgated by the United States Green Building Council, or comparable scoring system. The Town shall include a minimum of LEED Silver Certification, or equivalent level in comparable building scoring system, as a required element in requests for proposal or bids it issues soliciting architectural design services for construction, major renovation, and addition to its buildings, unless the Permanent Town Building Committee makes the finding that such certification is not in keeping with the use or purpose of the building or is otherwise inappropriate. No building project shall be deemed complete until LEED Silver Certification or greater, or equivalent, has been confirmed, unless the PTBC makes the finding that such certification is not in keeping with the use or purpose of the building or is otherwise inappropriate.

ART. 18, ATM 4/00, ART. 32 ATM 5/14/03

[http://www.town.arlington.ma.us/Public\\_Documents/ArlingtonMA\\_TownBylaws/title1#article16](http://www.town.arlington.ma.us/Public_Documents/ArlingtonMA_TownBylaws/title1#article16)

END OF SECTION

## INSURANCE REQUIREMENTS

### 1. GENERAL

A. This section specifies the Owner's requirements for insurance and relates to the General Conditions of the Contract for Construction and Supplementary Conditions of the Contract for Construction.

B. Provisions of the General Conditions of the Contract for Construction and Supplementary General Conditions of the Contract for Construction, which are not modified by the following insurance Requirements, remain in full effect.

### 2. INSURANCE REQUIREMENTS

A. Insurance Limits: The insurance required should be written for not less than the limits of liability required by law or the following limits, whichever is greater: State and federal Workmen's Compensation Statutory Benefits required by union contract as required.

#### GENERAL LIABILITY\*

General Liability- Bodily Injury and Property Damage Each Occurrence \$1,000,000.00

General Liability —Bodily Injury and Property Damage Aggregate \$2,000,000.00

General Liability shall include coverage for the following:

Comprehensive form

Premise/Operations Liability

Explosion, Collapse and Underground (XCU). Products/Completed

Operations (aggregate limit \$2,000,000.00) Contractual Liability

Independent Contractors Broad

Form Property Damage

Personal Injury Including Libel and Slander Coverage Broad

Form CGL Endorsement

#### AUTOMOBILE LIABILITY\*\*

Comp. Automobile Liability\*\* Bodily Injury and Property Damage Per Accident \$1,000,000.00

\*\*Provide coverage for All Owned, Non-Owned, and Hired vehicles.

#### EXCESS LIABILITY – Umbrella Form

Each occurrence \$5,000,000.00

Aggregate \$5,000,000.00

B. Exclusions: The Owner's property insurance shall not cover tools, equipment, shoring, staging, forms, temporary buildings or other equipment owned or rented by the Contractor, its Subcontractors, or any Worker.

C. Named Insured: Each Insurance policy certificate of insurance provided by the Contractor shall name the Town of Arlington as an additional insured. Each insurance policy and certificate of insurance provided by the Contractor shall contain a provision that the Owner shall be notified of cancellation or restrictive amendment at least thirty (30) days prior to the effective date of such cancellation or amendment.



D. Insurance Certificates: Submit insurance certificates for the Owner's review and approval prior to commencement of the work. The Contractor and all subcontractors who are required to provide insurance under the Contract shall provide accurate and bona fide "Certificates of insurance "issued by a responsible agent of the insurance company.

1. Certificate Content: Such "Certificates of Insurance" shall clearly indicate the insurance coverage. Each "Certificate of Insurance" shall be accompanied by a sworn and duly notarized statement from the responsible agent of the insurance company issuing the certificate clearly stating that all insurance specified and required by the Contract Documents is provided and in force, and also a clear statement of all exceptions and deviations, if any, from the Contract Document issuance requirements.

2. Responsibility: The insurance agent issuing and authorizing the "Certificate of Insurance" shall be responsible and liable for the accuracy and validity of the "Certificate of Insurance". Each insured party shall certify by sworn and duly notarized statement that the "Certificate of Insurance" issued for them are bona fide.

3. Disclaimers Prohibited: "Certificates of Insurance" shall not contain any disclaimers such as: "This Certificate is issued as a matter of information only and confers no right upon the certificate holder. This Certificate does not amend, extend, or alter the coverage afforded by the policies listed below." Disclaimers are not acceptable.

4. Certificates of Insurance Can Be Relied Upon: Parties receiving "Certificates of insurance" shall be entitled to rely upon the "Certificates of insurance" and shall have the right to claim the benefits and protection provided by the insurance as it applies to them.

5. Alternate to "Certificates of Insurance": Instead of providing the "Certificates of Insurance" and the sworn statements required above, the insured may provide bona fide and accurate copies of all insurance policies and riders accompanied by a sworn and duly notarized statement from the insured that the policies, riders, and documents submitted are bona fide and valid, and that parties receiving the insurance documents may rely on the documents as satisfaction of the Contract insurance requirements.

E. The Contractor shall provide "builder's risk" insurance as described in the General Conditions of the Contract for Construction and with limits equal to the full insurable completed value of the building under construction. The "Builder's Risk" insurance shall include "all risk" insurance for physical loss and damage including theft, vandalism, and malicious mischief. The "Builder's Risk" insurance shall be amended to delete any and all endorsements relating to cancellation of the policy due to partial occupancy by the Owner.

1. Builder's Risk Deductible Amount: \$1,000,000.00

END OF SECTION

## SECTION 00 31 43

### PERMITS

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION:

This Section provides specific information and defines specific requirements of the Contractor regarding the preparation and acquisition of permits required to perform the work of this project.

##### 1.02 RELATED WORK:

- A. Section 01 11 00, CONTROL OF WORK AND MATERIALS
- B. Section 01 14 19.16, DUST CONTROL
- C. Section 02 41 19, SELECTIVE STRUCTURE DEMOLITION
- D. Section 31 00 00, EARTHWORK
- E. Division 26 – ELECTRICAL

##### 1.03 GENERAL REQUIREMENTS:

- A. The Contractor shall apply for, obtain, and pay for all permits and licenses required, including but not limited to the permits listed below. Contractor shall also be responsible for all fees and costs associated with decommissioning and terminations of services.
- B. The Contractor shall procure all other permits, licenses, and approvals from Federal, State, and local authorities and such other agencies as may be necessary in connection with the work of this Contract.
- C. The Contractor shall perform the work in accordance with the Contract Documents, and any applicable Federal, State, and local requirements, and permits.
- D. The Contractor shall provide all required certificates to show that the work has been completed in conformity with the permits and shall submit such Certificates of Approval to the Engineer before final acceptance of the work.

<u>Permits by Owner</u>	<u>Status</u>
Building Permit	*
Electrical Permit	*
Plumbing Permit	*
Trench Permit	*

\*Contractor shall prepare permit application and obtain the permit after contract is awarded, bearing all expenses. Owner will pay for and/or waive the permit application fee, if applicable.

## PART 2 - PRODUCTS

Not Used.

## PART 3 – EXECUTION

### 3.01 PERFORM WORK IN ACCORDANCE WITH REQUIREMENTS:

- A. The Contractor shall perform the work in accordance with the Contract Documents, including the attached permits/order of conditions, and any applicable municipal requirements.
- B. Prior to commencing any construction activities, the Contractor shall demonstrate to the Owner and the Engineer, through on-site inspection and submitting copies of permits or approvals, that it is in full compliance with the terms and conditions of all permits specified herein. The Contractor shall maintain full compliance with all permits throughout the performance of the work, and upon request, grant access to permitting authorities to inspect the site for the purpose of verifying such compliance.

END OF SECTION

## SECTION 01 11 00

### CONTROL OF WORK AND MATERIALS

#### PART 1 – GENERAL

Not Used.

#### PART 2 – PRODUCTS

Not Used

#### PART 3 - EXECUTION

##### 3.01 HAULING, HANDLING AND STORAGE OF MATERIALS:

- A. The Contractor shall, at its own expense, handle and haul all materials furnished by it and shall remove any of its surplus materials at the completion of the work.
- B. The Contractor shall provide suitable and adequate storage for equipment and materials furnished by it that are liable to injury and shall be responsible for any loss of or damage to any equipment or materials by theft, breakage, or otherwise.
- C. All excavated materials and equipment to be incorporated in the Work shall be placed so as not to injure any part of the Work or existing facilities and so that free access can be had at all times to all parts of the Work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such location as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.
- D. The Contractor shall be responsible for all damages to the work under construction during its progress and until final completion and acceptance even though partial payments have been made under the Contract.

##### 3.02 OPEN EXCAVATIONS:

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The Contractor shall, at its own expense, provide suitable and safe means for

completely covering all open excavations and for accommodating travel when work is not in progress.

- B. Bridges provided for access to private property during construction shall be removed when no longer required.
- C. The length of open trench will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer.
- D. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, then special construction procedures shall be taken, such as limiting the length of trench and prohibiting stocking excavated material in the street.
- E. All street excavations shall be completely closed at the end of each work day. Backfilling or use of steel plates of adequate strength to carry traffic shall be used.

### 3.03 MAINTENANCE OF TRAFFIC:

- A. Unless permission to close the street is received in writing from the proper authority, all excavated materials and equipment shall be placed so that vehicular and pedestrian traffic may be safely maintained at all times.
- B. Should the Chief of Police deem it necessary, uniformed officers will be assigned to direct traffic. The Contractor shall make all arrangements in obtaining uniformed officers required.
- C. The Contractor shall at its own expense, as directed by the Police Traffic Control/Safety Officer, provide and erect acceptable barricades, barrier fences, traffic signs, and all other traffic devices not specifically covered in a bid item, to protect the work from traffic, pedestrians, and animals. The Contractor shall provide sufficient temporary lighting such as lanterns/flashers (electric battery operated) or other approved illuminated traffic signs and devices to afford adequate protection to the traveling public, at no additional cost to the Owner.
- D. The Contractor shall furnish all construction signs that are deemed necessary by and in accordance with Part VI of the Manual on Uniform Traffic Control Devices as published by the U.S. Department of Transportation. In addition, the Contractor may be required

to furnish up to 128 square feet of additional special construction warning signs. Size and exact wording of signs shall be determined by the Engineer during construction.

- E. The intent of policing is to ensure public safety by direction of traffic. Police officers are not to serve as watchmen to protect the Contractor's equipment and materials.
- F. Nothing contained herein shall be construed as relieving the Contractor of any of its responsibilities for protection of persons and property under the terms of the Contract.
- G. As this is a public park and public space. Contractor shall provide signage directing the public for a safe detour route through the park.

#### 3.04 CARE AND PROTECTION OF PROPERTY:

- A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, such property shall be promptly restored by the Contractor, at its expense, to a condition similar or equal to that existing before the damage was done, to the satisfaction of the Engineer.
- B. Contractor shall use all means necessary to protect and preserve the materials to be removed, store, and reinstalled in this project, as well as the fountain spillway, and statue. All artifacts are of a delicate nature. Any damage to existing or reinstalled items and features in this project shall be at the expense of the contractor, and will not be accepted until historical commission is satisfied.

#### 3.05 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES:

- A. All existing buildings, utilities, pipes, poles, wires fences, curbing, property line markers and other structures which the Engineer decides must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the contractor. Should such property be damaged, it shall be restored by the Contractor, at no additional cost to the Owner.
- B. The Contractor shall determine the location of all underground structures and utilities (including existing water services, drain lines, electrical lines, and sewers). Services to

buildings shall be maintained, and all costs or charges resulting from damage thereto shall be paid by Contractor.

- C. On paved surfaces the Contractor shall not use or operate tractors, bulldozers, or other power-operated equipment with treads or wheels which are shaped so as to cut or otherwise damage such surfaces.
- D. All property damaged by the Contractor's operations shall be restored to a condition at least equal to that in which it was found immediately before work was begun. Suitable materials and methods shall be used for such restoration.
- E. Restoration of existing property and structures shall be carried out as promptly as practicable and shall not be left until the end of the construction period.

### 3.06 MAINTENANCE OF FLOW:

- A. The Contractor shall at its own cost, provide for the flow of sewers and drains interrupted during the progress of the work, and shall immediately cart away and dispose of all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the Engineer well in advance of the interruption of any flow.
- B. All existing drainage facilities including, but not limited to; brooks, streams, canals, channels, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. If the Contractor damages or impairs any of the aforesaid drainage facilities, it shall repair the same within the same day.
- C. At the conclusion of the work, the Contractor shall remove all silt in drainage structures caused by its operations as described in Section 01 74 13, CLEANING UP.

### 3.07 REJECTED MATERIALS AND DEFECTIVE WORK:

- A. Materials furnished by the Contractor and condemned by the Engineer as unsuitable or not in conformity with the specifications shall forthwith be removed from the work by the Contractor, and shall not be made use of elsewhere in the work.
- B. Any errors, defects or omissions in the execution of the work or in the materials furnished by the Contractor, even though they may have been passed or overlooked or have appeared after the completion of the work, discovered at any time before the final

payment is made hereunder, shall be forthwith rectified and made good by and at the expense of the Contractor and in a manner satisfactory to the Engineer.

- C. The Contractor shall reimburse the Owner for any expense, losses or damages incurred in consequence of any defect, error, omission or act of the Contractor or his employees, as determined by the Engineer, occurring previous to the final payment.

### 3.08 SANITARY REGULATIONS:

Sanitary conveniences for the use of all persons employed on the work, properly screened from public observation, shall be provided in sufficient numbers in such manner and at such locations as may be approved. The contents shall be removed and disposed of in a satisfactory manner as the occasion requires. The Contractor shall rigorously prohibit the committing of nuisances within, on or about the work. Any employees found violating these provisions shall be discharged and not again employed on the work without the written consent of the Engineer. The sanitary conveniences specified above shall be the obligation and responsibility of the Contractor.

### 3.09 SAFETY AND HEALTH REGULATIONS:

This project is subject to the Safety and Health regulations of the U.S. Department of Labor set forth in 29 CFR, Part 1926, and to the Massachusetts Department of Labor and Industries, Division of Industrial Safety "Rules and Regulations for the Prevention of Accidents in Construction Operations (454 CMR 10.0 et. seq.)." The Contractor shall be familiar with the requirements of these regulations.

### 3.10 SITE INVESTIGATION:

The Contractor acknowledges that it has satisfied itself as to the conditions existing at the site of the work, the type of equipment required to perform this work, the quality and quantity of the materials furnished insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the drawings and specifications made a part of this contract. Any failure of the Contractor to acquaint itself with available information will not relieve it from the responsibility for estimating properly the difficulty or cost of successfully performing the work. The Owner assumes



no responsibility for any conclusion or interpretation made by the Contractor on the basis of the information made available by the Owner.

3.11 HANGERS, PADS, AND SUPPORTS:

- A. Unless otherwise indicated, hangers and supports shall be by the trade providing the supported item.
- B. Except where detailed or specified, design of hangers and supports shall be the responsibility of the Contractor. All parts of such hangers or supports shall be designed in accordance with accepted engineering practice, using a factor of safety of at least 2½.
- C. When proprietary hangers, etc., are supplied, satisfactory evidence of the strength of such items shall be furnished.
- D. Hangers for items hung from steel and concrete shall be centered on the vertical center of gravity of the beam.
- E. Locations and sizes of openings, sleeves, concrete pads, steel frames, and other equipment supports are indicated on the drawings for bidding purposes only. Final sizes and locations of such items shall be obtained from the shop drawings.

3.12 SLEEVES, HOLES, HANGERS, INSERTS, ETC.:

- A. Except where holes and openings are dimensioned, and hangers, inserts, and supports are fully called for on the architectural and structural drawings (or reference is made thereon to drawings containing such information) to accommodate mechanical or electrical items, they shall be by the mechanical or electrical trade concerned.
- B. Sleeves, inserts, anchors, etc., supplied under the mechanical and electrical contracts in sufficient time to so permit, shall be set in concrete, masonry, etc., or fastened to steel deck, etc., by the respective architectural or structural trade. Where not supplied in

sufficient time, installation of such items shall be the responsibility of the mechanical or electrical trade involved.

- C. Nothing shall be suspended from the steel roof deck and no fastenings made to it, except with the prior permission of the Engineer. Request for permission shall be accompanied by full details of the hanger or fastener, including the weight of the item to be suspended.
- D. Nailers and other wood members attached to steel or masonry, for which fasteners are not indicated on the design drawings or in the specification, shall be fastened with the equivalent of ½-inch diameter bolts at 3 feet o.c.
- E. Openings for mechanical and electrical items in finished areas of the building shall be closed off with near escutcheon plates or similar closures. These closures shall be by the mechanical or electrical trade involved.

### 3.13 WEATHER PROTECTION:

In conformance with Sections 44F and 44G of Chapter 149 of the General Laws of Massachusetts, the General Contractor shall install weather protection and shall furnish adequate heat in the area so protected during the months of November through March. Standards for such specifications shall be established by the Director of Building Construction in the Executive Office for Administration and Finance.

### 3.14 ELECTRIC SERVICE:

- A. The Contractor shall make all necessary applications and arrangements and pay for all fees and charges for electrical energy for power and light necessary for the proper completion of this contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, connections, and meters.
- B. There shall be sufficient electric lighting so that all work may be done in a workmanlike manner where there is not sufficient daylight.

END OF SECTION

## SECTION 01 12 16

### SCOPE AND SEQUENCE OF WORK

#### PART 1 – GENERAL

##### 1.01 WORK INCLUDED:

- A. Scope of work includes but is not limited to; demolition of the existing lower fountain basin, selective demolition of coping stones around lower basin, and granite stone in the upper and mid basin, cataloging and storing of coping stones and granite stones. Demolition of the vault cover, filtration system, electrical, and plumbing. Removal of the existing red brick walkways found on either side of the fountain and spillway.

Scope of work also includes, new lower basin, rehabilitation of the mid and upper basins including new hydraulic piping, waterproofing, and installation of basin masonry. New filtration and hydraulic distribution system, electrical and electrical bonding, domestic plumbing, new vault cover, vault HVAC, and re installation of red brick walkways.

- B. No work can commence or mobilization can occur till June 4<sup>th</sup>, 2018.

##### 1.02 RELATED WORK:

- A. SECTION 01 11 00 – CONTROL OF WORK AND MATERIALS

#### PART 2 - PRODUCTS (NOT APPLICABLE)

#### PART 3 - EXECUTION

##### 3.01 GENERAL:

- A. The Contractor shall be responsible for scheduling its activities and the activities of any subcontractors involved, to meet the completion date, or milestones, established for the contract. Scheduling of the work shall be coordinated with the Owner and Engineer.
- B. The Construction Sequence Requirements shall be used by the Contractor to form a complete schedule for the project, which shall be coordinated with the Owner and Engineer. Prior to performing any work at the site, the Contractor shall submit a

detailed plan to the Engineer for review. The plan shall describe the proposed sequence, methods, and timing of the work.

END OF SECTION

## SECTION 01 14 00

### SPECIAL PROVISIONS

#### PART 1 - GENERAL

Not used

#### PART 2 - PRODUCTS

Not used

#### PART 3 - EXECUTION

##### 3.01 WATER FOR CONSTRUCTION PURPOSES:

- A. In locations where water is in sufficient supply, the Contractor may be allowed to use water without charge for jetting backfill and other construction purposes. The express approval of the Owner shall be obtained before water is used. Waste of water by the Contractor shall be sufficient cause for withdrawing the privilege of unrestricted use.
- B. If no water is available, the Contractor shall supply water at no additional cost to the Owner.

##### 3.02 PIPE LOCATION:

Pipe shall be located substantially as indicated on drawings. The Owner reserves the right, acting through the Engineer, to make such modifications as may be deemed desirable to avoid interference with existing structures or for other reasons.

##### 3.03 DIMENSIONS OF EXISTING STRUCTURES:

Where the dimensions and locations of existing structures are of critical importance in the installation or connections of new work, the Contractor shall verify such dimensions and locations in the field before the fabrication of any material or equipment that is dependent on the correctness of such information.

##### 3.04 OCCUPYING PRIVATE PROPERTY:

The Contractor shall not enter upon nor occupy with men, equipment or materials any property outside of the public highways or Owner's easements, except with the written consent of the property owner or property owner's agent.

##### 3.05 EXISTING UTILITY LOCATIONS – CONTRACTOR'S RESPONSIBILITY:

- A. The location of existing underground services and utilities shown on the drawings is based on available records. It is not warranted that all existing utilities and services are

shown, or that shown locations are correct. The Contractor shall be responsible for having the utility companies locate their respective utilities on the ground prior to excavating.

- B. To satisfy the requirements of **Massachusetts law, Chapter 82, Section 40**, the Contractor shall, at least 72 hours, exclusive of Saturdays, Sundays and holidays, prior to excavation in the proximity of telephone, gas, cable television and electric utilities, notify the utilities concerned by calling "DIG SAFE" at telephone number: 1-888-344-7233. As Arlington is an MWRA community, please call 617-305-5956 for MWRA Permitting Department, Field Operations.
- C. The Contractor shall coordinate all work involving utilities and shall satisfy itself as to the existing conditions of the areas in which it is to perform his work. It shall conduct and arrange its work so as not to impede or interfere with the work of other contractors working in the same or adjacent areas.

### 3.06 COORDINATION OF WORK:

The General Contractor shall be responsible for coordinating its own work as well as that of any subcontractors. It shall be responsible for notification of the Engineer when each phase of work is expected to begin and the approximate completion date.

### 3.07 TIME FOR COMPLETION OF CONTRACT:

The time for completion of this contract is stipulated in the Form of/for General Bid. The Bidder shall base his bid on completing the proposed work by the completion date stipulated in Section 00 14 13, FORM OF/FOR GENERAL BID.

### 3.08 MAINTENANCE OF TRENCH SURFACE:

After backfilling and compacting the trench, the Contractor shall be responsible for keeping the ground surface dry and passable at all times until the surface has been restored to original conditions.

### 3.09 DESIGN OF EQUIPMENT:

Attention is directed to the fact that the layout of certain equipment is based on that of one manufacturer. If other equipment is submitted for approval, the Contractor shall prepare and submit for approval at its expense, detailed structural, mechanical and electrical drawings, equipment lists, maintenance requirements, and any other data required by the Engineer, showing all necessary changes and embodying all special

features of the equipment he proposes to furnish. Such changes, if approved, shall be made at the expense of the Contractor.

### 3.10 SERVICES OF MANUFACTURER'S REPRESENTATIVE:

- A. The Contractor shall arrange for a qualified service representative, at a time suitable to the Engineer, from the company manufacturing or supplying certain equipment as indicated on the detailed specifications, to perform the duties described herein.
- B. After installation of the listed equipment has been completed and the equipment is presumably ready for operation, but before others operate it the representative shall inspect, operate, test, and adjust the equipment. The inspection shall include, but shall not be limited to, the following points as applicable:
  - 1. Soundness (without cracks or otherwise damaged parts); completeness in all details, as specified; correctness in setting, alignment, and relative arrangement of various parts; adequacy and correctness of packing, sealing and lubricants.
  - 2. The operation, testing, and adjustment shall be as required to prove that the equipment is left in proper condition for satisfactory operation under the conditions specified. Where called for in the specifications, vibration readings shall be made and the equipment balanced accordingly.
  - 3. On completion of its work, the Contractor shall submit in triplicate to the Engineer the manufacturer's or supplier representative's complete signed report of the results of its inspection, operation, adjustments, and test. The report shall include detailed descriptions of the points inspected, tests and adjustments made, quantitative results obtained if such are specified, and suggestions for precautions to be taken to ensure proper maintenance. The report shall also include a certificate that the equipment conforms to the requirements of the contract and is ready for permanent operation and that nothing in the installation will render the manufacturer's warranty null and void.
  - 4. After the Engineer has reviewed the reports from the manufacturer's representative, the Contractor shall make arrangements to have the manufacturer's representative present when the field acceptance tests are made.

### 3.11 COMPLIANCE WITH PERMITS:

- A. The Contractor shall perform all work in conformance with requirements of the Permits, which appear in Section 00 31 43 – PERMITS.

### 3.12 CUTTING, FITTING AND PATCHING:

- A. The Contractor shall do all cutting, fitting, or patching of its work that may be required to make its several parts come together properly and fit it to receive or be received by

work of other Contractors, as shown upon or reasonably implied by the drawings and the specifications for the completed structure, including all existing work.

- B. The Contractor shall not endanger any work by cutting, digging, or otherwise and shall not cut or alter the work of any other Contractor, save with the consent of the Engineer.
- C. All holes or openings required to be made in new or existing work, particularly at pipe, conduit, or other penetrations not covered by escutcheons or plates shall be neatly patched. All such holes shall be made completely watertight as approved by the Engineer.
- D. Size and locations of holes required in steel, concrete, or other structural or finish materials for piping, wiring, ducts, etc., which have not been located and detailed on the drawings shall be approved by the Engineer prior to layout and cutting thereof. All holes shall be suitably reinforced as required by the Engineer.
- E. Workmanship and materials of patching and repair work shall match the adjacent similar work and shall conform to the applicable sections of the specification. Patches and joints with existing work shall provide, as applicable in each case, visual, structural, and waterproofing continuity.

### 3.13 CONTRACTOR'S REPRESENTATIVE:

The Contractor shall designate a representative who will be available to respond to emergency calls by the Owner at any time day and night and on weekends and holidays should such a situation arise.

### 3.14 VISUAL RECORDING:

Before beginning construction, the Contractor shall make a color DVD recording along the entire work length. One complete recording, for the entire project length, shall be



furnished to the Engineer prior to the start of the work. The visual recording shall be identified by street name, as applicable, and station.

3.15 OPERATOR TRAINING:

A trained representative of the manufacturer of all equipment shall instruct the plant operating personnel on the operation and maintenance of the equipment. The Owner reserves the right to videotape all training sessions.

3.16 HOURS OF CONSTRUCTION ACTIVITY:

- A. The Contractor shall conduct all construction activity between 7:00 a.m. and 5:00 p.m., Monday through Friday. No construction work shall be allowed on Saturdays, Sundays or Holidays without written authorization from the Owner.

3.17 CONSTRUCTION CREWS:

The Contractor shall not increase the number of construction crews assigned to the work without providing one-week advance notice to the Engineer.

3.18 MASSACHUSETTS DATA SECURITY REGULATIONS:

The Contractor is required to comply with data security regulations contained in 201 CMR 17.00 that have been established to safeguard personal information of Massachusetts residents contained in paper or electronic records. The Contractor shall not submit to the Engineer or Owner documents in paper or electronic form that contain personal information (person's name combined with one or more of the following – Social Security Number, driver's license number or state-issued identification card number, financial institution account number, or credit or debit card number). Any document submitted to the Engineer that violates this provision shall be returned to the Contractor and the Contractor shall remove personal information from the document prior to resubmitting it to the Engineer. The Contractor shall require each Subcontractor to also comply with the MA data security regulations insofar as they involve submittal of personal information to the Engineer and Owner.

3.19 CONTRACTOR EXPERIENCE

The contractor/subcontractor shall have at least 5 years' experience restoring and repairing historic projects in similar scope and importance to the Arlington Menotomy Fountain. Contractor/subcontractor conservator should provide a resume with examples of at least three projects similar in scope and importance and the name of the conservation entity shall be included on the Bid Form where designated. The list should include names and dates of these projects as well as the names and contact information

for the person or group in charge of these projects. These project shall provide whom they used for specialty work such as, Masonry, Landscaping, and specialty finishes.

### 3.19 COMPLIANCE

The significance of this project has been previously defined in the State and/ or National Registry of Historic Places. The integrity is defined in the U.S Department of the Interior's Secretary of the Interior's Standards for the Treatment of Historic Properties and the Guidelines for the Treatment of Cultural Landscapes as, "the authenticity of a property historic identity, evinced by the survival of physical characteristics that existed during the property's history period. The seven qualities of integrity as defined by the National Register Program are location, setting, feeling, association, design, workmanship, and materials".

The contractor submitting this bid, herein shall uphold all requirements and standards set for the by U.S. Department of the Interior's Secretary of the Interiors Standards.

END OF SECTION

## SECTION 01 31 19.23

### CONSTRUCTION MEETINGS

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. This Section specifies requirements for project meetings including but not limited to Pre-Construction Conference and Progress Meetings.
- B. It shall be the responsibility of the Contractor to coordinate work between all subcontractors, sections, and trades required for the proper completion of the Work.

##### 1.02 PRE-CONSTRUCTION CONFERENCE:

- A. After the bids have been opened but prior to the start of the construction there will be a pre-construction conference to discuss the phasing and scheduling of the Project. The specific time and place of the conference shall be arranged by the Engineer after the Contract has been awarded.
- B. This pre-construction conference is intended to establish lines of communication between the parties involved, review responsibilities and personnel assignments, establish project schedules, discuss proposed performance methods, and coordinate Work to be performed by subcontractors.
- C. Authorized representatives of the Owner, Engineer and their consultants, the Contractor, its Superintendent and Site Foreman, and all others invited by the Contractor, shall attend the pre-construction conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
- D. Discuss items of significance at the pre-construction conference that could affect progress including at least the following:
  - 1. Tentative construction schedule
  - 2. Critical Work sequencing
  - 3. Designation of responsible personnel
  - 4. Procedures for processing field decisions and Change Orders
  - 5. Procedures for processing Applications for Payment
  - 6. Review of Davis Bacon and other federal requirements
  - 7. Distribution of Contract Documents

8. Submittal of Shop Drawings, Product Data and Samples
9. Preparation of record documents
10. Use of the premises
11. Office, work and storage, and laydown areas
12. Equipment deliveries
13. Construction safety procedures
14. Environmental health and safety procedures
15. First aid
16. Security
17. Housekeeping
18. Working hours
19. Traffic Control
20. Emergency Vehicle Access to and around work site
21. Environmental protection measures for construction site

### 1.03 PROGRESS MEETINGS:

- A. During the course of the Project, the Contractor shall attend weekly progress meetings as scheduled by the Owner. The Owner, based on work progress and activities, may adjust the progress meetings to biweekly or other. The attendance of subcontractors may be required during the progress of the Work. The Contractor's delegate to the meeting shall be prepared and authorized to discuss the following items:
  1. Progress of Work/Critical Work Sequencing in relation to Contract Schedule.
  2. Proposed Work activities for forthcoming period.
  3. Resources committed to Contract.
  4. Coordination of Work with others.
  5. Status of procurement of equipment and materials.
  6. Status of Submittals.
  7. Outstanding actions, decisions, or approvals that affect Work activities.
  8. Site access and/or security issues
  9. Hazards and risks
  10. Housekeeping
  11. Quality issues
  12. Potential Claims
  13. Change Orders
  14. Costs, budget, and payment requests
- B. The Contractor shall revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized and the revised schedule shall be submitted to the Engineer and Owner.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

Not used.

END OF SECTION

## SECTION 01 32 16

### CONSTRUCTION SCHEDULING

#### PART 1- GENERAL

##### 1.01 PROGRAM DESCRIPTION

- A. A Critical Path Method (CPM) construction schedule shall be used to control the work of this Contract and to provide a definitive basis for determining job progress. The Contractor shall prepare the construction schedule. All work shall be done in accordance with the established CPM schedule and the Contractor and his subcontractors shall be responsible for cooperating fully with the Engineer and the Owner in effectively utilizing the CPM schedule.
- B. The CPM schedule to be prepared and submitted by the Contractor shall consist of a CPM network (diagram of activities) and a computer-generated schedule (print-out) as specified herein. The format shall be the activity-on-node precedence network.
- C. The Contractor shall develop his own outline of the work and prepare his proposed CPM schedule. The computer-based schedule shall be the product of a recognized commercial computer software producer and shall meet all of the requirements defined herein.

##### 1.02 QUALIFICATIONS

- A. The Contractor shall have the capability of preparing and utilizing the specified CPM scheduling technique. A statement of CPM capability shall be submitted by the Contractor in writing to the Engineer within 10 days after the issuance of the Notice to Proceed to verify that either the Contractor's organization has in-house capability qualified to use the technique or that the Contractor employs a consultant who is so qualified. Capability shall be verified by description of the construction projects to which the Contractor or his consultant has successfully applied the CPM scheduling technique and which were controlled throughout the duration of the project by means of systematic use and updating of a computer-based CPM schedule. The submittal shall include the name of the individual on the Contractor's staff who will be responsible for the CPM schedule and for providing the required updating information.

##### 1.03 NETWORK REQUIREMENTS

- A. The network shall show the order and inter-dependence of activities and the sequence in which the work is to be accomplished as planned by the Contractor. The **basic concept of a network analysis diagram** shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities.
- B. Detailed network activities shall include: construction activities, the submittal and approval of shop drawings, the procurement of materials and equipment, fabrication of materials and equipment and their delivery, installation and testing, start-up and training. The Contractor shall break the work into activities with durations no longer than twenty

working days each, except as to non-construction activities (such as procurement of materials and delivery of equipment) and any other activities for which the Engineer may approve the showing of longer duration. To the extent feasible, **activities related** to a specific physical area of the work should be grouped on the network for ease of understanding and simplification.

- C. Separate activities shall be provided for each significant identifiable function in each trade area in each facility. Activities shall be so identified that there will be no reasonable doubt as to how much work remains on each. Specific activities which shall be included are: all subcontract work, all interface work between subcontractors and between the Contractor and subcontractors, leakage tests of pipelines, electrical connections to each item of equipment, supplier and manufacturer technical assistance, mechanical connections to each item of equipment, all tests, concrete finishing, each item of site work, (including restraints on other activities) and all utilities, fuels and chemicals.
- D. Each activity on the network shall have the following indicated on the NODE representing it.
  - 1. A single duration (i.e., the single best estimate of elapsed time considering the scope of the work involved in the activity and the resources planned for accomplishing the activity) expressed in working days.
  - 2. A five character (or less) code indicative of the party responsible for accomplishing the activity.
  - 3. A cost estimate for each activity which, when accumulated with the cost of all activities, equals the total contract cost. Estimated overhead and profit shall be prorated throughout all activities. Materials costs shall be assigned to delivery activities.
  - 4. A brief description of the activity.
- E. The selection and number of activities shall be subject to the Engineer's approval. The detailed network need not be time scaled but shall be drafted to show a continuous flow from left to right with no flow from right to left. In addition to the brief description, the Contractor shall submit a separate list of all activities containing a detailed narrative of the scope of each activity, including the trades, subcontractors involved, and number of man-hours estimated.
- F. To the extent that the network or any revision thereof shows anything not jointly agreed upon or fails to show anything jointly agreed upon, it shall not be deemed to have been approved by the Engineer. Failure to include on a network any element of work required for the performance of this Contract shall not excuse the Contractor from completing all work required within any applicable completion date, notwithstanding the review of the network by the Engineer.
- G. Except where earlier completions are specified, CPM schedules, which show completion of all work prior to the contract completion date, may be approved by the Engineer but

in no event shall they be acceptable as a basis for claim for delay against the Owner by the Contractor.

1.04 COMPUTER-GENERATED SCHEDULE REQUIREMENTS

- A. Each computer-generated schedule submittal from the CPM activity network shall include the following tabulations: a list of activities in numerical order, a list of activity



precedence's, a schedule sequenced by Early Start Date and a schedule sequenced by Total Float. Each schedule shall include the following minimum items:

1. Activity numbers
2. Estimated duration
3. Activity description
4. Early start date (calendar dated)
5. Early finish date (calendar dated)
6. Latest allowable start date (calendar dated)
7. Latest allowable finish date (calendar dated)
8. Status (whether critical)
9. Estimated cost of the activity
10. Total float and free float

B. In addition, each schedule shall be prefaced with the following summary data:

1. Contract name and number
2. Contractor's Name
3. Contract duration
4. Contract schedule
5. The effective or starting date of the schedule.

C. The workday to calendar date correlation shall be based on an 8-hour day and 40-hour week with adequate allowance for holidays, adverse weather and all other special requirements of the work.

#### 1.05 SUBMITTALS

- A. Within 10 days following the issuance of the Notice to Proceed, the Contractor shall submit 4 copies of the CPM Schedule to the Engineer for review and acceptance. The Contractor shall submit to the Engineer a preliminary network defining the planned operations during the first 60 calendar days after the issuance of the Notice to Proceed. The Contractor's general approach for the balance of the project shall be indicated. Cost

of activities expected to be completed or partially completed before submission and approval of the complete network shall be included.

#### 1.06 APPROVED CPM SCHEDULE

- A. Following review by the Engineer, the Contractor shall incorporate the Engineer's comments into the network and submit five prints and two reproducibles of the revised network and two copies of the computer-generated schedule. This final submittal shall be delivered to the Engineer within 60 days after the issuance of the Notice to Proceed.
- B. CPM schedules, which contain activities showing negative, float or which extend beyond the contract completion date in the computer-generated schedule will not be approved.
- C. The approved network shall then be the approved CPM schedule to be used by the Contractor for planning, organizing and directing the work, and reporting progress.
- D. Approval of the CPM activity network by the Engineer is advisory only and shall not relieve the Contractor of responsibility for accomplishing the work within the contract completion date. Omissions and errors in the approved CPM schedule shall not excuse performance less than that required by the Contract. Approval by the Engineer in no way makes the Engineer an insurer of the CPM schedule's success or liable for time or cost overruns flowing from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of approval by its agent, the Engineer, of the CPM schedule.
- E. The CPM activity network shall be submitted on sheets 24-in by 36-in and may be divided into as many separate sheets as required. An electronic file in PDF format shall be submitted concurrent with the hard copy schedule.

#### 1.07 PROGRESS REPORTING

- A. Progress under the approved CPM schedule shall be evaluated monthly by the Contractor. Not less than seven days prior to each monthly progress meeting, The Contractor shall evaluate the status of each activity on which work has started or is due to start, based on the preceding CPM schedule; to **show actual progress**, to identify those activities started and those completed during the previous period, to show the estimated time required to complete or the percent complete of each activity started but not yet completed and to reflect any changes indicated for the network. Activities shall not be considered complete until they are, in fact, 100 percent complete.
- B. At each progress meeting the Contractor shall submit a narrative report based on the CPM schedule evaluation described above, in a format agreed upon by the Contractor and the Engineer. The report shall include a description of the progress during the previous period in terms of completed activities, an explanation of each activity which is showing a delay, a description of problem areas, current and anticipated delaying factors and their estimated impact on performance of other activities and completion dates and an

explanation of corrective action taken or proposed. This report, as well as the CPM Status Report, will be discussed at each progress meeting.

#### 1.08 RESPONSIBILITY FOR SCHEDULE COMPLIANCE

- A. Whenever it becomes apparent from the current CPM schedule and narrative report that delays to the critical path have resulted and the contract completion date will not be met, the Contractor shall take some or all of the following actions at no additional cost to the Owner. He shall submit to the Engineer for approval, a written statement of the steps he intends to take to remove or arrest the delay to the critical path in the approved schedule.

#### 1.09 ADJUSTMENT OF CONTRACT SCHEDULE AND COMPLETION TIME

- A. If the Contractor desires to make changes in his method of operating which affect the approved CPM schedule, he shall notify the Engineer in writing stating what changes are proposed and the reason for the change. If the Engineer approves these changes, the Contractor shall revise and submit for approval, without additional cost to the Owner, all of the affected portions of the CPM network. The Contractor shall adjust the CPM schedule only after prior approval of his proposed changes by the Engineer.
- B. If the completion of any activity, whether or not critical, falls more than 100 percent behind its approved duration, the Contractor shall submit for approval a schedule adjustment showing each such activity divided into two activities reflecting completed versus uncompleted work.
- C. Shop drawings which are not approved on the first submittal or within the schedule time and equipment which do not pass the specified tests shall be immediately rescheduled.
- D. The contract time will be adjusted only for causes specified in this Contract. In the event the Contractor requests an extension of any contract completion date, he shall furnish such justification and supporting evidence as the Engineer may deem necessary to determine whether the Contractor is entitled to an extension of time under the provisions of this Contract. The Engineer will, after receipt of such justification and supporting evidence, make findings of fact and will advise the Contractor in writing thereof. If the Engineer finds that the Contractor is entitled to any extension of any contract completion date, the Engineer's determination as to the total number of day's extension shall be based upon the currently approved CPM schedule and on all data relevant to the extension. Such data shall be included in the next updating of the schedule. Actual delays in activities, which, according to the CPM schedule, do not affect any contract completion date shown by the critical path in the network, will not be the basis for a change therein.
- E. Each request for change in any contract completion date shall be submitted by the Contractor to the Engineer within 30 days after the beginning of the delay for which a time extension is requested but before the date of final payment under this Contract. No

time extension will be granted for requests, which are not submitted within the foregoing time limit.

1.10 COORDINATING SCHEDULES WITH OTHER CONTRACT SCHEDULES

- A. Where work is to be performed under this Contract concurrently with or contingent upon work performed on the same facilities or area under other contracts, the Contractor's CPM Schedule shall be coordinated with the schedules of the other contracts. The Contractor shall obtain the schedules of the other appropriate contracts from the Owner for the preparation and updating of his CPM schedule and shall make the required changes in his schedule when indicated by changes in corresponding schedules.
- B. In case of interference between the operations of different contractors, the Owner will determine the work priority of each Contractor and the sequence of work necessary to expedite the completion of the entire project. In all such cases, the decision of the Owner shall be accepted as final. The temporary delay of the Contractor's work due to such circumstances shall not be considered as justification for claims for additional compensation.

END OF SECTION

## SECTION 01 32 33

### CONSTRUCTION PHOTOGRAPHS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section covers construction progress photographs to be furnished by the Contractor on the project.
- B. Construction photographs shall be provided by a commercial photographer acceptable to the Engineer.

#### PART 2 - PRODUCTS

##### 2.01 PHOTOGRAPHS AND PRINTS:

- A. Digital photographs shall be in .gif, .jpeg, .bmp or .tif format.
- B. Prints shall be 8 x 10 full color on single weight, white base, and glossy paper, mounted with binder tabs.
- C. Photographs shall be taken using a digital camera before groundbreaking, monthly throughout the Work, and on final acceptance of the project.
- D. Twenty-four views shall taken **once per month (specifier edit appropriately)**. The Engineer shall approve selection of views. The Engineer will select eight views to be made into prints, from each disc produced at the frequency specified above.
- E. Three prints of each of the eight views shall be furnished at the frequency specified above.

#### PART 3 - EXECUTION

##### 3.01 COMPUTER DISC:

- A. The twenty-four views shall be delivered to the Engineer on a CD-ROM Disc within six days of exposure.
- B. Discs turned over to the Engineer shall be retained by the Engineer for future reference during the project.

##### 3.02 PRINTS:

- A. Each print shall be identified on the back with name of project, phase, orientation of view, date and time of exposure, name and address of photographer, and photographer's numbered identification of exposure.
- B. Prints shall be delivered within 15 days after Engineer selects the views to print.

END OF SECTION

## SECTION 01 33 23

### SUBMITTALS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. The Contractor shall provide the Engineer with submittals as required by the contract documents.

##### 1.02 RELATED WORK:

- A. Divisions 1 – 48 of these specifications that require submittals.

#### PART 2 - PRODUCTS

NOT USED

#### PART 3 - EXECUTION

##### 3.01 GENERAL:

- A. As required by the General Conditions, Contractor shall submit a schedule of shop and working drawing submittals.
- B. The Contractor shall submit the shop and working drawing submittals either electronically or hard copy.

##### 3.02 ELECTRONIC SUBMITTALS:

- A. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer by email ([marianom@wseinc.com](mailto:marianom@wseinc.com)), one electronic copy in Portable Document Format (PDF) of shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract.
- B. Each electronic copy of the shop or working drawing shall be accompanied by the Engineer's standard shop drawing transmittal form, included as Exhibit 1 of this section (use only for electronic submittals), on which is a list of the drawings, descriptions and

numbers and the names of the Owner, Project, Contractor and building, equipment or structure.

- C. The Contractor shall receive a shop drawing memorandum with the Engineer's approval or comments via email.

### 3.03 HARD COPY SUBMITTALS:

- A. In accordance with the accepted schedule, the Contractor shall submit promptly to the Engineer, by mail (to Weston & Sampson Engineers, attention: CSD), six (6) copies each of shop or working drawings required as noted in the specifications, of equipment, structural details and materials fabricated especially for this Contract.
- B. Each shipment of drawings shall be accompanied by the Engineer's (if applicable) standard shop drawing transmittal form on which is a list of the drawings, descriptions and numbers and the names of the Owner, Project, Contractor and building, equipment or structure.

### 3.04 SHOP AND WORKING DRAWINGS:

- A. Shop and working drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish of shop coat, grease fittings, etc., depending on the subject of the drawings. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for this Contract.
- B. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from his subcontractors and returning reviewed drawings to them. All shop and working drawings shall be prepared on standard size, 24-inch by 36-inch sheets, except those, which are made by changing existing standard shop or working drawings. All drawings shall be clearly marked with the names of the Owner, Project, Contractor and building, equipment or structure to which the drawing applies, and shall be suitably numbered. Each shipment of drawings shall be accompanied by the Engineer's (if applicable) standard shop drawing transmittal form on which is a list of the drawings, descriptions and numbers and the names mentioned above.
- C. Only drawings that have been prepared, checked and corrected by the fabricator should be submitted to the Contractor by his subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Contract Documents in all respects. Shop drawings shall be reviewed and marked with the date, checker's name and indication of the Contractor's approval, and only then shall be submitted to the Engineer. Shop drawings unsatisfactory to the Contractor shall be returned directly to their source for correction, without submittal to the Engineer. Shop drawings submitted to the Engineer without the Contractor's approval stamp and signature will



be rejected. Any deviation from the Contract Documents indicated on the shop drawings must be identified on the drawings and in a separate submittal to the Engineer, as required under subsection 6.17 Shop Drawings and Samples; D. Submittal Procedures, Paragraph 3 of the 1996 General Conditions.

- D. The Contractor shall be responsible for the prompt submittal and resubmittal, as necessary, of all shop and working drawings so that there will be no delay in the work due to the absence of such drawings.
- E. The Engineer will review the shop and working drawings as to their general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Corrections of comments made on the drawings during the review do not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for: confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner. The review of the shop drawings is general and shall not relieve the Contractor of the responsibility for details of design, dimensions, code compliance, etc., necessary for interfacing with other components, proper fitting and construction of the work required by the Contract and for achieving the specified performance. The Engineer will review submittals two times: once upon original submission and a second time if the Engineer requires a revision or corrections. The Contractor shall reimburse the Owner amounts charged to the Owner by the Engineer for performing any review of a submittal for the third time or greater.
- F. With few exceptions, shop drawings will be reviewed and returned to the Contractor within 30 days of submittal.
- G. No material or equipment shall be purchased or fabricated especially for this Contract nor shall the Contractor proceed with any portion of the work, the design and details of which are dependent upon the design and details of equipment or other features for which review is required, until the required shop and working drawings have been submitted and reviewed by the Engineer as to their general conformance and compliance with the project and its Contract Documents. All materials and work involved in the construction shall then be as represented by said drawings.
- H. Two copies of the shop and working drawings and/or catalog cuts will be returned to the Contractor. The Contractor shall furnish additional copies of such drawings or catalog cuts when he needs more than two copies or when so requested.

### 3.05 SAMPLES:

- A. Samples specified in individual Sections include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual

effect, graphic symbols, and units of work to be used by the Engineer or Owner for independent inspection and testing, as applicable to the work.

- B. The number of samples submitted shall be as specified. Submittal and processing of samples shall follow the procedures outlined for shop and working drawings unless the specifications call for a field submittal or mock-up.
- C. Acceptance of samples will be acknowledged via a copy of the transmittal noting status. When samples are not acceptable, prompt resubmittal will be required.

3.06 OPERATING AND MAINTENANCE MANUALS AND SPARE PARTS LISTS:

- A. Where reference is made in technical specification sections to operating and maintenance manuals and/or spare parts lists, the Contractor shall submit four copies to the Engineer for review in accordance with the instructions furnished under "Shop and Working Drawings." If the submittal is complete and does not require any changes, an acknowledgement (copy of transmittal) will be returned noting status. If the submittal is incomplete or does require changes, corrections, additions, etc., two copies of the submittal will be returned with a copy of transmittal noting status. Four copies of the final operating and maintenance manuals and/or spare parts list shall be delivered to the Engineer prior to or with the equipment when it is delivered to the job site. For systems requiring field adjustment and balancing, such as heating and ventilating, the Contractor shall submit separate test results and adjustment data on completion of the work, to be incorporated into the system manual.
- B. The information included in the manual shall be as described in the specification sections, but as a minimum shall contain clear and concise instructions for operating, adjusting, lubricating and maintaining the equipment, an exploded assembly drawing identifying each part by number and a listing of all parts of the equipment, with part numbers and descriptions required for ordering spare parts. Spare parts lists shall include recommended quantity and price.
- C. Operating and maintenance manuals shall be in durable loose-leaf binders, on 8½-inch by 11-inch paper, with diagrams and illustrations either on 8½-inch by 11 inch or multiple foldouts. The instructions shall be annotated to indicate only the specific

equipment furnished. Reference to other sizes or models of similar requirement shall be deleted or neatly lined out.

END OF SECTION

EXHIBIT 1 TO SECTION 01 33 23 SUBMITTALS  
SHOP DRAWING TRANSMITTAL FORM

Shop Drawing Transmittal				Weston & Sampson <sup>SM</sup>			
<b>Instruction for Preparing Transmittal</b> No action will be taken on any item unless accompanied by this form. TRANSMITTAL NOS. to be consecutive (1, 2, 3, etc.). Each resubmittal of same item shall use same number with suffix letter (A, B, etc.). SPEC. SECT. NO.: Only one spec. section no. to each transmittal. DESCRIPTION: Complete identification of document or group of documents. SOURCE: Originator of document(s) being submitted.				DRAWING NO.: Identification of document(s). CONTRACT DRAWING REFERENCE: Contract drawing number(s) showing details of document(s). SPECIAL INSTRUCTIONS: Special cases and emergencies, changes in distribution and special handling requests, etc. should be entered here. SIGNATURE OF CONTRACTOR: Signature of individual who reviews and approves material prior to submittal to engineer.			
THIS SECTION TO BE COMPLETED BY CONTRACTOR							
TRANSM. NO.		SPEC. SECT. NO.	DATE	CONTRACTORS JOB NO.		W&S JOB NO.	
PROJECT NAME & CONTRACT NO.				LOCATION			
Attention: CSD ( <a href="mailto:David@wsainc.com">David@wsainc.com</a> ) Weston & Sampson Engineers, Inc. 5 Centennial Drive Peabody, MA 01960-7985				F R O M			
By W&S							
ITEM NO.	DESCRIPTION	SOURCE	DRAWING NO. CATALOG NO. BROCHURE, ETC	NO. OF COPIES	CONTRACT DRAWING REF.	ACTION CODE	REVIEWED BY
1							
2							
3							
4							
THIS CERTIFIES THAT ALL ITEMS SUBMITTED HEREWITH HAVE BEEN CHECKED BY THE CONTRACTOR, ARE IN CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS, EXCEPT AS NOTED, AND ARE APPROVED BY THE CONTRACTOR FOR THIS PROJECT.							
THIS SECTION TO BE COMPLETED BY WESTON & SAMPSON							
ACTION CODE: 1. NO EXCEPTIONS TAKEN 2. MAKE CORRECTIONS NOTED 3. AMEND AND RESUBMIT 4. REJECTED- SEE REMARKS 5. ACKNOWLEDGEMENT 6. SUBMITTAL NOT REQUIRED, RETURNED WITHOUT REVIEW				8. INSTALLATION SHALL PROCEED ONLY WHEN ACTION CODE IS 1 OR 2 9. ACTION CODED 3 SHALL BE RESUBMITTED WITHIN TIME LIMIT SET IN CONTRACT 10. REVIEW DOES NOT RELIEVE CONTRACTOR FROM RESPONSIBILITY OF COMPLIANCE WITH ALL REQUIREMENTS OF THE CONTRACT DOCUMENTS			
				Weston & Sampson			

## SECTION 01 56 26

### TEMPORARY CHAIN LINK FENCE

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. The Contractor shall provide all labor, materials and appurtenances necessary for the installation, maintenance and dismantling of 8-foot temporary fencing.
- B. The Contractor shall be responsible for securing the site from trespassers. Existing fencing exists on portions of the site as shown on the Contract Drawings; it will be at the discretion of the Contractor to determine whether the existing fence is suitable for site safety and security. The Contractor shall install temporary fencing across lengths of damaged/unsuitable fencing to secure the site and prevent trespassers.
- C. Contractor shall set up a temporary fence, around the proposed plantings found to the south of the Lower Basin. This temporary fence will become possession of the Town / Historical Commission at the conclusion of the project.

##### 1.02 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturers literature of the materials specified herein shall be submitted to the Engineer for review.
- B. Six sets of shop drawings of the temporary chain link fence and gates shall be submitted to the Engineers for review.
  - 1. Shop drawings shall indicate layout of temporary fencing, location and size of gates, existing pavement and roads, and other site specific conditions. Prepare drawing after site observation and verification of existing conditions.

#### PART 2 - PRODUCTS-GALVANIZED

##### 2.01 TEMPORARY CHAIN LINK FENCING

- A. Unless otherwise indicated, type of 8-foot temporary chain link fencing shall be Contractor's option. Following types are acceptable:
  - 1. New materials or previously used salvaged chain link fencing in good condition.
  - 2. Posts: Galvanized steel pipe of diameter to provide rigidity. Post shall be suitable for setting in concrete footings, driving into ground, anchoring with base plates, or inserting in precast concrete blocks.

3. Fabric: Woven galvanized steel wire mesh. Provide in continuous lengths to be wire tied to fence posts or prefabricated into modular pipe-framed fence panels.
  4. Screen: The historical commission has a specific screen that shall be installed by the Contractor in a location determined by the Historical commission. The Historical Commission is providing approximately 40 LF of screen. The contractor shall furnish and install screen on the remaining unscreened temporary fence.
- B. Gates: Provide gates of the quantity and size indicated on the Contract Drawings or required for functional access to Site.
1. Fabricate of same material as used for fencing.
  2. Vehicle gates:
    - a. Minimum width: 20 feet to allow access for emergency vehicles.
    - b. Capable of manual operation by one person.

## 2.02 DECORATIVE TEMPORARY FENCE (Alt #3)

- A. Fence shall be a galvanized wire mesh, that is coated with a black resin coating. The fence shall be a minimum of 36" in vertical height and shall appear to have the pattern as shown on the contract drawings. Wire shall be 8 Gauge wire, and shall be attached using wire ties at the proposed poles.
- B. Poles shall be 1.5" in diameter, galvanized steel, with a black resin coating. Poles shall be placed every 5 FT on center. Poles shall be driven into the ground and not concrete or permanently placed. All poles shall have a cap.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. The fence and gates shall be erected by skilled mechanics in accordance with the recommendations of the manufacturer and these specifications. These specifications shall take precedence over the recommendations of the manufacturer if any discrepancy exists between them.
- B. Posts
  1. Maximum post spacing shall be 10-feet. Post spacing shall be uniform and posts shall be plumb.
  2. Drive posts, set in holes and backfill, or anchor in precast concrete blocks.
  3. For soft and unstable ground conditions, cast concrete plug around post.

4. Posts over pavement: Use steel post plates or precast concrete blocks.
  5. Gate posts: Use bracing or concrete footings to provide rigidity for accommodating size of gate.
  6. Temporary terminal posts shall be securely connected to existing fence posts to prevent site access/trespassing.
- C. Securely attach wire fabric to posts. Maximum area of unbraced fence fabric shall not exceed 1,500 square feet.
- D. Install with required hardware.
- E. Fabric shall be stretched taut, with the bottom edge following the existing grade, and shall be a continuous mesh between terminal posts. Each span of fabric shall be attached independently at terminal posts. Where terminal posts do not have provisions for weaving fabric to posts, stretcher bars shall be placed through the end weave of the fabric and secured to the post with bar bands spaced not more than 15-inches apart on the post. Temporary terminal posts shall be secured to existing fence posts to prevent Site access/trespassing.
- F. Fabric shall be attached with ties to line posts at intervals of not more than 14-inches (and to the top railing and braces at intervals not exceeding 24-inches).
- G. The bottom tension wire shall be interlaced in the weave of the fabric, pulled taut and fastened to terminal posts.

### 3.02 MAINTENANCE AND REMOVAL

- A. Maintain fencing in good condition. If damaged, immediately repair.
- B. Remove temporary fencing upon completion of Work or when no longer required for security or control. Backfill holes and compact. Holes in pavement shall be surfaced to match existing paving. Repair damage caused by installation of temporary fencing.

END OF SECTION



## SECTION 01 74 13

### CLEANING UP

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

The Contractor must employ at all times during the progress of its work adequate cleanup measures and safety precautions to prevent injuries to persons or damage to property. The Contractor shall immediately, upon request by the Engineer provide adequate material, equipment and labor to cleanup and make safe any and all areas deemed necessary by the Engineer.

##### 1.02 RELATED WORK:

- A. Section 000 72 00 GENERAL CONDITIONS
- B. Section 01 11 00 CONTROL OF WORK AND MATERIALS
- C. Section 01 14 00 SPECIAL PROVISIONS

#### PART 2 - PRODUCTS

Not applicable

#### PART 3 - EXECUTION

##### 2.01 DAILY CLEANUP:

- A. The Contractor shall clean up, at least daily, all refuse, rubbish, scrap and surplus material, debris and unneeded construction equipment resulting from the construction operations and

sweep the area. The site of the work and the adjacent areas affected thereby shall at all times present a neat, orderly and workmanlike appearance.

- B. Upon written notification by the Engineer, the Contractor shall within 24 hours clean up those areas, which in the Engineer's opinion are in violation of this section and the above referenced sections of the specifications.
- C. If in the opinion of the Engineer, the referenced areas are not satisfactorily cleaned up, all other work on the project shall stop until the cleanup is satisfactory.

#### 2.02 MATERIAL OR DEBRIS IN DRAINAGE FACILITIES:

- A. Where material or debris has washed or flowed into or has been placed in existing watercourses, ditches, gutters, drains, pipes, structures, such material or debris shall be entirely removed and satisfactorily disposed of during progress of the work, and the ditches, channels, drains, pipes, structures, and work shall, upon completion of the work, be left in a clean and neat condition.

#### 2.03 REMOVAL OF TEMPORARY BUILDINGS, STRUCTURES AND EQUIPMENT:

- A. On or before completion of the work, the Contractor shall, unless otherwise specifically required or permitted in writing, tear down and remove all temporary buildings and structures it built; shall remove all temporary works, tools and machinery or other construction equipment it furnished; shall remove all rubbish from any grounds which it has occupied; shall remove silt fences and hay bales used for trapping sediment; and shall leave the roads and all parts of the property and adjacent property affected by its operations in a neat and satisfactory condition.

#### 2.04 RESTORATION OF DAMAGED PROPERTY:

- A. The Contractor shall restore or replace, when and as required, any property damaged by its work, equipment or employees, to a condition at least equal to that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk and landscaping work. Materials, equipment, and methods for such restoration shall be as approved by the Engineer.

#### 2.05 FINAL CLEANUP:

- A. Before acceptance by the Owner, the Contractor shall perform a final cleanup to bring the construction site to its original or specified condition. This cleanup shall include removing

all trash and debris off of the premises. Before acceptance, the Engineer shall approve the condition of the site.

END OF SECTION

Document2

## SECTION 01 78 00

### PROJECT CLOSEOUT

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This Section covers administrative and procedural requirements for closing out the project, including, but not limited to:
  - 1. Project as-built documents
  - 2. Checkout and Certification
  - 3. Startup and Testing
  - 4. Final Cleaning
  - 5. Substantial Completion
  - 6. Closeout Procedures
  - 7. Final Completion
  - 8. Correction/Warranty Period
- B. Closeout checklist to be completed by the Engineer.

##### 1.02 RELATED WORK:

- A. General Requirements in their entirety.
- B. Section 01 74 13, CLEANING UP
- C. Division 2 through Division 16.

##### 1.03 AS-BUILT DOCUMENTS:

- A. Contractor shall maintain on site, separate from the documents used for construction, one set of the documents listed below, and as construction progresses, shall legibly record on these documents all changes made during construction.
  - 1. Contract Drawings.
  - 2. Specifications.

3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Written interpretations and clarifications.
7. Field Orders.
8. Field test reports properly verified.

- B. The completed set of as-built documents shall be submitted to the Engineer with the final Application for Payment.

#### 1.04 CHECKOUT AND CERTIFICATIONS:

- A. Prior to checkout and certifications the following tasks shall be completed:
  1. Construction shall be complete. For this purpose, completion of construction is defined as follows:
    - a. The Contractor has completed construction and erection of the work in conformance with the Contract Drawings and Specifications.
    - b. The Contractor has installed and adjusted operating equipment, systems, or facilities, as applicable, as defined by the manufacturers' erection, installation, operation and maintenance instructions.
  2. All shop drawings shall have final approval.
  3. All shop tests shall be complete and approved test results submitted to the Engineer.

#### 1.05 START-UP AND TESTING:

- A. Prior to start-up the following tasks shall be complete:
  1. All checkout and certifications shall be satisfactorily completed,
  2. All operations and maintenance manuals shall be approved,
  3. All preliminary training by the manufacturer's representative shall be completed,
  4. An approved start-up procedure shall be in place.

#### 1.06 FINAL CLEANING:

- A. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
  - 1. Clean the site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to smooth, even textured surfaces.
  - 2. Remove waste and surplus materials, rubbish, fencing equipment, temporary utilities and construction facilities from the site, unless otherwise required by the Engineer.
  - 3. Comply with requirements of Section 01 74 13 CLEANING UP.

1.07 SUBSTANTIAL COMPLETION:

- A. Substantial Completion is officially defined in the General and Supplementary Conditions. The date of substantial completion will be certified by the Engineer. This date will not be certified until the following requirements have been satisfied by the Contractor:
  - 1. All Contract requirements are coordinated into a fully operational system. All individual units of equipment and treatment are fully operative and performing at specified efficiencies. Where efficiencies are not specified, performance shall meet acceptable standards for the particular unit.
  - 2. All field tests have been satisfactorily completed and reports forwarded to the Engineer.
  - 3. All final training has been completed by the manufacturers' representatives.
  - 4. All spare parts and lubricants have been satisfactorily delivered to the Owner. Spare parts are for the exclusive use of the Owner when the facility has been turned over. Contractor is responsible for all maintenance and repair materials required until the facility is accepted by the Owner.

1.08 CLOSEOUT PROCEDURES:

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and is complete in accordance with Contract Documents and ready for Engineer's and Owner's inspection.
- B. Accompany Engineer and Owner on inspection to verify conformance with the Contract Documents. Prepare a punch list of work items that have been determined by inspection to not conform to Contract Documents. Punch list items shall include work items that are missing, incomplete, damaged, incorrect items, or improperly installed or constructed.

The Contractor shall correct the punch list deficiencies by re-work, modifications, or replacement, as appropriate, until the items conform to the Contract Documents. The initial punch list shall be produced by the Contractor, with copies to the Engineer and Owner. When the Contractor has reduced the number of deficient items to a reasonable level, the Engineer will develop a definitive punch list for the use of the Contractor.

- C. Provide submittals to Engineer that are required by governing or other authorities.
- D. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due. The Contractor shall submit the following documents with or prior to Final Application for Payment: Set of as-built documents, Contract Completion and Acceptance Certificate, Consent of Surety to Final Payment, Release and Waiver of Liens and Claims, Affidavit of Payment of Debts and Claims, and remaining releases, waivers, warranties/guarantees, and all other data required by the Contract Documents.

1.09 FINAL COMPLETION:

- A. Prior to final completion, the following tasks shall be completed:
  - 1. All items in the punch list shall be completed.
  - 2. All Contract closeout documentation shall be submitted to and accepted by the Engineer.

1.10 CORRECTION/WARRANTY PERIOD:

- A. During the correction period, the Contractor shall correct all deficiencies in equipment and materials.
- B. During the warranty period, the Contractor shall perform all corrective work on warranty deficiencies.
- C. Corrective work will be identified by the Engineer or Owner, as appropriate. The Contractor will be notified of the item(s) requiring corrective work.
- D. The Contractor shall begin work on all corrective work within ten days of being notified of the deficiency by the Engineer and shall then work continuously until the deficiency is

corrected. Upon completion of the corrective work, the Contractor shall submit a letter report to the Engineer describing the deficiency and the corrective action that was taken.

- E. The Contractor shall coordinate all corrective work with the Engineer and/or the Owner.

#### 1.11 COMPLETION CHECKLIST:



## PROJECT COMPLETION CHECKLIST

Owner \_\_\_\_\_ Job No. \_\_\_\_\_

Project \_\_\_\_\_

As part of the project closeout, all items listed below must be checked off as being complete or otherwise accounted for. The person verifying completion of the item shall list the completion date and his/her initials.

Project Closeout Checklist		
	Date Completion Verified	Verified by
<b>AS-BUILT DOCUMENTS HANDED OVER</b>		
1. Contract Drawings		
2. Specifications		
3. Addenda		
4. Change Orders/Contract Modifications		
5. Reviewed Shop Drawings, Product Data and Samples		
6. Written Interpretations/Clarifications		
7. Field Orders		
8. Field Test Reports		
<b>EQUIPMENT CHECKOUT AND CERTIFICATIONS</b>		
1. Construction Complete per Drawings/Specifications		
2. Equipment Installed and Adjusted		
3. All Shop Drawings have Final Approval		
4. All Shop Tests Complete and Results Submitted		

Project Closeout Checklist		
	Date Completion Verified	Verified By
<b>START-UP AND TESTING</b>		
1. All Checkout and Certifications Complete		
2. All O&M Manuals Approved		
3. All Preliminary Training by Manufacturers Rep. Completed		
<b>FINAL CLEANING</b>		
1. All Construction Facilities Removed		
2. All Construction Debris Removed		
3. All Areas Swept/Cleared		
<b>SUBSTANTIAL COMPLETION</b>		
1. All Items Coordinated Into a Fully Operational System		
2. All Equipment Units Operational at Specified Efficiencies		
3. All Field Tests Completed and Reports Submitted		
4. All Final Training by Manufacturer's Rep. Completed		
5. All Spare Parts and Lubricants Provided		
<b>CLOSEOUT PROCEDURES</b>		
1. Written Certification Submitted that Work is Ready for Owner & Engineer Inspector		
2. Inspection by Owner, Engineer, Contractor completed		
3. Punch List of Nonconforming Items Prepared		
4. Documents Required by Governing or Other Authorities Submitted (List Them)		
5. Final Application for Payment Received		
6. Contact Completion and Acceptance Certificate Submittal		
7. Consent of Surety to Final Payment Submittal		
8. Release and Waiver of Liens and Claims Submitted		
9. Affidavit of Payment of Debts and Claims Submitted		

Project Closeout Checklist		
	Date Completion Verified	Verified By
10. Warranties/Guarantees Submitted		
11. Other Required Releases and Waivers Submitted (List Them)		
12. Permits Submitted (List Them)		
13. Weekly Payrolls Submitted as Required by Law		
<b>FINAL COMPLETION</b>		
1. All Items in Punch List Completed		
2. All Other Required Documentation Submitted (List It)		
<b>CORRECTION/WARRANTY PERIOD</b>		
1. Correction Period Start Date: _____  End Date: _____		
2. Specific Warranties Provided		
<div> <div>Item</div> <div>Warranty Duration</div> </div>		

Full name of persons signing their initials on this checklist:

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END OF SECTION

## SECTION 02 41 19

### SELECTIVE DEMOLITION

#### PART 1 - GENERAL

##### 1.01 SUMMARY:

- A. Provide selective demolition of designated lower basin pool, collector tank, mechanical piping, mechanical equipment, with selective demolition of upper basin, mid basic, vault cover, and caulking on the spillway joints.
- B. Items identified in the plans and specifications shall be removed, cataloged, properly stored, and reinstalled under the direction of engineer, landscape architect, owner, and historical commission.
- C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- D. Contractor shall submit to the engineer and historical commission a detail plan demonstratring how they intend ot protect the statue, benches, wall, spillway, and other sensitive items during construction.

##### 1.02 DEFINITIONS:

- A. Remove: Detach items from existing construction and legally dispose of them off-site.
- B. Removed and Reinstalled: Existing items removed and reinstalled in their original locations after selective demolition.
- C. Existing to Remain: Existing items of construction that are not to be removed and salvaged, or removed and reinstalled.

##### 1.03 SUBMITTALS:

- A. Schedule: Submit selective demolition schedules, including schedule and methods for capping utilities to be abandoned and maintaining existing utility service
  - 1. Contractor shall detail in the demolition submittal procedure below:
    - a. System for cataloging each stone.
    - b. Procedure for proper storage, and location of storage.
    - c. Procedure to remove concrete.
    - d. Procedure to protect existing structures.
    - e. Procedure to properly shore existing structures.
    - f. Procedure to selectively excavate around, near, and through structures and protective trees.

#### 1.04 QUALITY ASSURANCE:

- A. Codes and Regulations: Comply with governing codes and regulations. Use experienced workers
- B. Experience: Contractor or individuals performing the selective demolition shall have experience in selective demolition of historical projects in similar nature. Contractor shall submit three projects, successfully completed in the last five years.

#### 1.05 PROJECT CONDITIONS:

- A. Occupancy: Immediate areas of work will be occupied during selective demolition. The facility employees may occupy adjacent areas outside of Work limit. Coordinate demolition schedule with Owner activities.
- B. Existing Conditions: No responsibility for items to be demolished will be assumed by the Owner.

#### 1.06 PRE-DEMOLITION CONFERENCE:

- A. Contractor shall hold a conference with Owner, Engineer, and Historical Commission prior to demolition but after an approved demolition plan. All parties will review the approved demolition plan, for scope of removal, staging areas, removal of landscaping, and routing of piping. Irrigation lines shall be pre-marked prior to this conference.

### PART 2 - PRODUCTS

#### 2.01 DEMOLITION APPLICATIONS:

- A. Selective Building Demolition:
  - 1. Application: Protection of portions of building or affected by selective demolition.
  - 2. Application: Notification to Owner of schedule of shut-off of utilities which serve occupied spaces.
  - 3. Application: Pollution control during selective demolition, including noise control.
  - 4. Application: Removal and legal disposal of materials.
  - 5. Utilities: Interruption, capping or removal as applicable.
  - 6. Hazardous Materials:
    - a. Not present in doors or walls. If encountered, stop work immediately and notify the Owner and the Engineer.
- B. Selective Demolition of Upper and Mid Basins:
  - 1. Removal, catalog, and storage of existing basin stones.

2. Removal and dispose of existing waterproofing
3. Removal and dispose of existing concrete in order to install new piping and remove existing.
4. Removal, storage, and catalog of existing water fall and weir stone.

C. Concrete Ripples

1. Removal of existing caulk joints on the perimeter edges of the ripples.
2. Removal, catalog, and storage of existing stepping stones.

D. Lower Basin

1. Removal, catalog, and storage of existing coping stones.
2. Removal and disposal of the basin in entirety.
3. Removal of plumbing interconnecting to the basin.
4. Selective demolition around the concrete ripple and basin interface.
5. Removal and storage of brick walkways around the existing lower basin.
6. A 3 FT x 3 FT section of the basin floor shall be removed in full depth, stored, and protected on site for mock up review.

E. Fountain Equipment Vault

1. Removal and disposal the existing vault roof.
2. Removal and disposal of all equipment found in the vault, including but not limited to piping, filtration equipment, electrical equipment, domestic plumbing, and domestic plumbing devices.
3. Electrical demolition shall be brought to the main feeders found in the Arlington Town Hall.
4. Existing lights found in the grotto area shall be disconnected in the vault and capped in place. No removal of the lighting, conduit, or wiring for the lights found in the grotto shall occur.

## PART 3 - EXECUTION

### 3.01 SELECTIVE DEMOLITION:

- A. Demolition Operations: Do not damage building elements and improvements indicated to remain. Utilities: Locate, identify, disconnect, and seal or cap off utilities in buildings to be demolished.
- B. Occupied Spaces: Do not obstruct occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.
- C. Operations: Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.
- D. Security: Provide adequate protection against accidental trespassing. Secure project after work hours.
- E. Restoration: Restore finishes of patched areas and any damaged adjacent construction and finishes.

### 3.02 TEMPORARY SHORING

- A. Provide and maintain temporary shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of the existing structure and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
  - 1. Strengthen or add new supports when required during progress of selective demolition.
- B. Care shall be taken not to damage any portion of the permanent Work. Damage to the permanent Work during installation or removal of the temporary shoring shall be repaired by the Contractor at his own cost.
- C. The Contractor shall inspect temporary works on a daily basis to ensure that they are safe and have not been damaged due to construction or environmental exposure. Any damage or deficiencies in temporary works that could be perceived as unsafe or that may results in imminent danger shall be corrected immediately.

### 3.03 SCHEDULE

- A. Items to be Salvaged for Reinstallation:
  - 1. None
- B. Items to be Salvaged for Delivery to Owner:
  - 1. None
- C. Utilities Requiring Interruption, Capping, or Removal:



1. Electric
2. Plumbing
3. Mechanical

END OF SECTION

## SECTION 03 01 30.62

### REPAIR OF EXISTING CONCRETE STRUCTURES

#### PART 1 GENERAL

##### 1.01 WORK INCLUDED:

Furnish all labor, materials, equipment and incidentals required to repair deteriorated areas of existing concrete structures including the sealing of existing joints as required by the Engineer in the field and as specified herein.

##### 1.02 RELATED WORK:

- A. Section 01 33 23, SUBMITTALS
- B. Division 03, CONCRETE
- C. Division 31, EARTHWORK

##### 1.03 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING

- A. Prior to shipment, the Contractor shall submit to the Engineer for review, six (6) copies of each of the following: manufacturer's technical literature for epoxy bonding agent, adhesive anchor system, repair mortar, polyurethane chemical grout, and strip and seal system. The Contractor shall include manufacturer's installation and or application instructions in the submittal.
- B. A complete, easily readable functional description of the proposed product.
- C. Upon completion of installation, the results of the field and acceptance tests as specified under this section of the specification shall be submitted to the Engineer.
- D. Furnish written certification from the manufacturer's representative of the proper installation and use of each product.

##### 1.04 REFERENCES:

- A. The following standards form a part of this specification and indicate the minimum standards required:

American Society for Testing and Materials (ASTM)

ASTM C881 -Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

ASTM C882 -Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE:

- A. Do not begin repair work until authorized by the Engineer to do so.
- B. When removing deteriorated concrete erect barriers or other protective devices to prevent damage to the structures beyond the limits of new work, protect personnel, control dust and prevent damage by falling or flying debris.
- C. Unless otherwise indicated or specified, saw cut the limits of all concrete repairs.
- D. Furnish a notarized certificate stating that the materials to be provided meet the requirements of this Section and have the manufacturer's current printed literature on the specified product.

1.06 MANUFACTURER'S QUALIFICATIONS:

- A. Consideration shall be given only to well-established and reliable manufacturers who are regularly engaged in such work and thoroughly experienced in the design and manufacture of said systems. The manufacturer shall certify a minimum of ten (10) years of experience in the manufacture and use of the products specified under this section as evidence of meeting the experience requirement.
- B. The system described herein and shown on the drawings establishes a standard of required type, function and quality to be met by any proposed substitute or "or-equal" systems. All "or-equal" systems shall meet the exact system configuration and operational function as shown on the drawings and specified herein. No "or-equal" system shall be considered by the Engineer unless written request for approval has been submitted for and approved by the Engineer in writing. The burden of proof of merit for the proposed "or-equal" systems is upon the Contractor and the proposed equipment manufacturer. The Engineer's decision of approval or disapproval of a proposed item shall be final. If the Engineer approves any "or-equal" item, the Contractor shall indemnify, hold harmless and defend both the Owner and the Engineer from any claims associated with the "or-equal" systems. Approval of "or-equal" systems does not relieve the Contractor of any requirements specified herein, called for by the Engineer or shown on the drawings.

1.07 DELIVERY, STORAGE AND HANDLING:

Deliver products in original, unopened containers clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions. Storage and condition of products shall be as recommended by the manufacturer.

## 1.08 WARRANTY:

- A. The manufacturer shall warranty, in writing, that the products supplied under this Section fully meet the criteria specified herein, and shall further warranty that the products are free from all defects in materials and workmanship.
- B. The manufacturer's warranties from defects shall contain a provision that the manufacturer shall repair or replace any defects, to the satisfaction of and at no additional cost to the Owner, for a period of twelve (12) months from the date of Substantial Completion.

## PART 2 – Products

### 2.01 PATCHING MATERIALS:

- A. Materials shall comply with this Section and any Federal, State or local VOC limitations.
- B. Epoxy Bonding Agent

Provide a two-component, solvent-free, asbestos free moisture insensitive epoxy resin material used to bond plastic concrete to hardened concrete where indicated on the Drawings or directed by the Engineer. The Epoxy bonding agent shall comply with the requirements of ASTM C881, Type 11, Grade 2. Epoxy bonding agent shall be Sikadur 32, Hi-Mod by Sika Corporation, Lyndhurst, NJ; Epoxy Adhesive CR631 by Sto Concrete Restoration Division, Amherst, MA; Euco 452MV by Euclid Chemical Co., Cleveland, OH, or equal.

- C. Repair Mortar

- 1. Repair mortar shall be a two-component, polymer-modified, cementitious, fast-setting, trowel grade, non-sag, structural repair mortar suitable for use on horizontal, vertical and overhead surfaces, on grade, above, and below grade on concrete and mortar.
- 2. Material
  - a. The polymer modified cementitious system shall consist of a factory pre-proportioned two-component system whose components conform to the following requirements:
- 3. Component A shall be a liquid polymer emulsion of an acrylic copolymer base and additives. This acrylic copolymer shall have the following properties:
  - i. Minimum film forming temperature approximately 68 degrees F
  - ii. Tensile Strength approximately 990 to 1,420 psi

- iii. Elongation at break 500 to 900 percent
  - iv. Particle Size Range Less than 0.1 micron
- 4. Component B shall be a blend of selected Portland cements, specially graded aggregates, organic accelerator and admixtures for controlling setting time, water reducers for workability and a corrosion inhibitor.
- 5. The component ratio A:B shall be 1:7.2 by weight for horizontal repairs and 1:5.2 by weight for vertical and overhead repairs. The system shall not contain chlorides, nitrates, added gypsum, added lime, or high alumina cements. The system shall be non-combustible, either before or after cure.
- a. Typical Properties of Mixed Components
  - 1. Application Time (Working Time) -15 minutes after combining components
  - 2. Finishing Time – 20 to 60 minutes after combining components
  - 3. Color – Concrete Gray
- b. Typical Properties of Cured Material
  - 1. Splitting Tensile Strength (ASTM C496) -750 psi minimum at 28 days
  - 2. Bond Strength.(ASTM C882) -2,200 psi minimum at 28 days
  - 3. Thermal Compatibility (ASTM C884) -passes test
  - 4. Compressive Strength (ASTM C109) -1 day, 3,000 psi minimum 7 days, 5,500 psi minimum 28 days, 7,000 psi minimum
  - 5. Flexural Strength (ASTM C293) -28 days, 2,000 psi minimum
  - 6. This system shall not produce a vapor barrier.
  - 7. This system shall be thoroughly compatible with concrete.
  - 8. For horizontal repairs greater than 1-inch in thickness 3/8-inch coarse aggregate may be added. Do not use limestone aggregate.
- c. Approved manufacturers include:
  - 1. Repair mortar for horizontal surfaces shall be SikaTop 122 Plus by Sika Corporation, Lyndhurst, NJ or equal.
  - 2. Repair mortar for vertical and overhead surfaces shall be SikaTop 123 Plus by Sika Corporation, Lyndhurst, NJ or equal.

## 2.02 BACKER RODS:

- A. Open Cell Backer Rod -Extruded, open cell polyurethane foam. Diameter shall be not less than 200 percent of the joint width dimension.

- B. Closed Cell Backer Rod -Extruded, nonstaining, resilient closed cell polyethylene foam, compatible with sealant. Diameter shall be not less than 25 percent greater than the joint width. Sealant shall not adhere to backer rod.

## 2.03 POLYURETHANE CHEMICAL GROUT:

### A. General

- a. The grouting compound shall be a single component, expanding, moisture reactive polyurethane grout that is designed to seal cracks and open joints in concrete. The cured chemical grout shall form a compressed closed cell urethane foam that shall completely fill the crack or joint.
- b. An accelerator may be used if recommended by the approved polyurethane chemical grout manufacturer.
- c. Injection packers shall be required for application of polyurethane chemical grout in existing concrete.

### B. Material

- a. Properties of cured material
  - 1. Tensile Strength (ASTM D 1623): 15.5 psi minimum at 1 day. Elongation at Break – 25 percent.
  - 2. Shear Strength (ASTM C273): 11.70 psi minimum at 1 day.
  - 3. Shrinkage (ASTM D2126): 0 percent
  - 4. Water Absorption (ASTM D2842): 0.09 lb/square ft
  - 5. Density (ASTM D1 622): 1.64 lb/cubic ft

### C. Approved manufacturers include:

Sika Corporation, Lyndhurst, NJ – SilcaFix HH-LV, or equal.

## PART 3 – EXECUTION

### 3.01 GENERAL:

- A. Repair deteriorated areas of concrete and seal existing joints and cracks as required by the Engineer and as specified herein.
- B. All commercial products shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations and as specified herein.
- C. Where concrete is repaired in the vicinity of an expansion joint or control joint, preserve the isolation between components on either side of the joint.

### 3.02 CONCRETE REMOVAL:

- A. When removing deteriorated concrete, saw cut the limits of removal. Remove concrete such that existing concrete and reinforcing to be left in place and existing equipment in place are not damaged.
- B. Remove fractured, loose, deteriorated and unsound concrete by bush hammering, chipping, high pressure water blast or other appropriate means. Remove all dirt, oil, grease and all other bond inhibiting materials from surface. Exposed reinforcing steel, reinforcing to be incorporated into repair mortar, and corroded reinforcing steel shall be treated as specified herein. Saturate existing concrete surfaces with water. Restore area to original limits or as shown using repair mortar. Comply with manufacturer's recommendations for concrete removal, surface preparation, mixing, application, finishing, and curing.
- C. Repair or replace concrete specified to be left in place, which is damaged during concrete modifications as required by the Engineer at no additional cost to the Owner.

### 3.03 CONNECTION SURFACE PREPARATION FOR NEW CONCRETE:

- A. Prepare connection surfaces as specified below for concrete areas requiring patching or repairs as indicated on the Drawings, specified herein, or as required by the Engineer.
- B. Remove all loose and deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means such as sandblasting, chipping or wire brushing. Uniformly roughen the concrete surface to approximately 1/4-in. amplitude with pointed chipping tools. Thoroughly clean surface of loose or weakened material and dust by dry mechanical means such as sandblasting and air blasting. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into the parent concrete.
- C. If reinforcing steel is exposed, clean it by dry mechanical means to remove all loose material, contaminants and rust as approved by the Engineer. If half of the diameter of the reinforcing steel or more is exposed, chip out a minimum of 1-in of concrete behind the steel. Do not damage reinforcing to be incorporated in new concrete while removing existing concrete.
- D. Prepare concrete surfaces in accordance with the following as indicated, specified or as required by the Engineer.
  - a. Method A – After the existing concrete surface at connection has been roughened and cleaned, thoroughly saturate with water and maintain saturation for a period of at least 12 hours. Brush on a 1/16-in. layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture as indicated.

- b. Method B – After the existing concrete surface has been roughened and cleaned, apply epoxy-bonding agent at connection surface. The field preparation and application of the epoxy-bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture as indicated within time constraints recommended by the manufacturer to ensure bond.

#### 3.04 POLYURETHANE CHEMICAL GROUT:

- A. Apply polyurethane chemical grout to leaking cracks, joints, and voids in existing concrete.
- B. Clean concrete surfaces as required by the manufacturer of the polyurethane chemical grout.
- C. The polyurethane chemical grout shall be installed through drilled-in injection ports installed as recommended by the polyurethane chemical grout manufacturer. Installation and curing of polyurethane chemical grout shall be in accordance with manufacturer's requirements.
- D. Remove all excess material from the interior face of walls, floors, etc. and the exterior face of walls to the satisfaction of the Engineer.
- E. Remove all injection ports and seal with grout. The repair area shall be flush with the surrounding concrete surface.
- F. At completion of repairs, the Contractor, Engineer, and installers of the materials used on the repairs shall inspect the work. Any leaky joints, cracks, or voids shall be repaired in accordance with the manufacturer's instructions at no additional cost to the Owner. At the completion of the repairs, the Contractor, Engineer, and installers of the materials shall again inspect the repaired problem areas.

END OF SECTION



## SECTION 03 11 00

### CONCRETE FORMWORK

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section of the specifications covers the furnishing and installation of forms for cast-in-place concrete.

##### 1.02 RELATED WORK:

- A. Section 03 21 00, CONCRETE REINFORCEMENT
- B. Section 03 30 00, CAST-IN-PLACE CONCRETE
- C. Section 03 37 13, SHOTCRETE

##### 1.03 REFERENCES:

The following standards form a part of this specification:

#### AMERICAN CONCRETE INSTITUTE (ACI)

ACI 301 Standard Specifications for Structural Concrete

ACI 347 Recommended Practices for Concrete Formwork

#### U.S. ARMY CORPS OF ENGINEERS (CE)

CE 03300 Cast-in-Place Concrete

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

- A. Forms for exterior and interior surfaces which will be exposed to view after the work is completed, whether such surfaces are painted or unpainted, shall be new plywood stock, steel, tempered masonite, or other materials which will provide smooth concrete surfaces without subsequent surface plastering. Plastic or plastic-faced forms shall not be used, except with the prior approval of the Engineer.
- B. Form ties shall be cone type or equal, with waterstop, which leaves no metal closer than 2-inches to finished face of concrete.

- C. Interior surface of the fountain basin form shall be lined with a form liner to provide a surface that reduces the visible appearance of form lines, but also to provide a rough surface that would allow the adherence of the cementitious waterproofing and plaster finish.
- D. Form release agent shall be a non-staining, non-yellowing, non-toxic liquid free from kerosene and resins of the type recommended by the manufacturer of the forming system being used such as EZ strip by L&M Construction Chemicals, Omaha, NB and "Magic Kote" by Symons Corp., Des Plaines, IL or approved equal.
- E. Where steel adjacent to vertical faces of forms cannot be otherwise secured, mortar doughnuts shall be used to prevent steel from lying too close to the finish vertical faces of the concrete.

### PART 3 - EXECUTION

#### 3.01 PREPARATION:

Surfaces of forms to be in contact with concrete shall be greased with nonstaining form release compound. Wetting will not be accepted as a substitute. Approval of the Engineer shall be obtained before use of coated materials or liners in lieu of form release compound, except as modified herein.

#### 3.02 CONSTRUCTION:

- A. For concrete surfaces which will be visible after completion of the structure, painted or unpainted, the type and the precise location of form ties, nails joints between form members, and any other features which will leave a visible trace in the finished concrete, will be subject to the approval of the Engineer.
- B. Formwork shall be so constructed, braced, or tied that the formed surfaces of the concrete will be perfectly true, smooth, and to the dimensions shown on the drawings. All forms used for circular sections shall be true arcs as indicated on the drawings. Short chords will not be acceptable. Form line shall present an uninterrupted surface conforming to radii indicated on the drawings.
- C. Forms shall be sufficiently tight to prevent leakage of mortar, and when necessary shall have temporary openings as required for thorough cleaning, and as required for introduction of concrete to avoid excessive free fall. Panels damaged in stripping or otherwise shall not be reused.
- D. Unless otherwise noted on the design drawings, forms shall be filleted and chamfered at all sharp corners, and exposed edges with a 3/4-inch chamfer. Chamfer shall not be used where masonry or other material will subsequently be installed flush with one of the adjacent surfaces of the concrete. Where a wash or slope is indicated on the drawings no additional chamfer is required.

### 3.03 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent of the ultimate strength prescribed by the design and not before reaching the following number of day-degrees [whichever is the longer]:

<u>Forms for</u>	<u>Day-Degree*</u>
Beams and Slabs	500
Walls and vertical surfaces	200

\* Day-Degree: Total number of days times average daily air temperature at surface of concrete. For example, 5 days at a daily weighted average temperature of 60 deg F equals 300 day-degrees. Temperatures below 50 deg F are not to be considered in determining Day-Degree.

- B. Where beams, girder, columns, walls and similar vertical forms are adequately supported on shores, the side forms may be removed after 24 hours of cumulative curing time provided the side forms support no loads other than the lateral pressure of the plastic concrete. Cumulative curing time represents the sum of time intervals, not necessarily consecutive, during which the temperature of the air surrounding the concrete is above 50 deg. F in accordance with American Concrete Institute standards.
- C. Shoring shall not be removed until the concrete has attained at least 70 percent of the specified strength and sufficient strength to support safely its own weight and the construction live loads upon it.
- D. Forms shall be removed in such a manner as not to impair safety and serviceability of the structure. Concrete exposed by form removal shall have sufficient strength not to be damaged by the removal operation.

END OF SECTION

## SECTION 03 21 00

### CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section of the specification covers the furnishing and installation of reinforcement for cast-in-place concrete.

##### 1.02 RELATED WORK:

- A. Section 03 11 00, CONCRETE FORMWORK
- C. Section 03 30 00, CAST-IN-PLACE CONCRETE

##### 1.03 SYSTEM DESCRIPTION:

Materials and construction shall conform to ACI 318 and ACI 350 unless otherwise noted on the design drawings or modified herein.

##### 1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. The Contractor shall furnish the Engineer with complete checked, reinforcing steel shop drawings and bar lists. Shop drawing shall include grade of steel used as well as splice lengths.
- B. Mill test reports shall accompany drawings. Fabrication shall not commence until the drawings and mill test reports have been released by the Engineer.
- C. When fiber reinforcement is used, contractor shall submit manufacturer's data confirming that material meets the specification.

##### 1.05 REFERENCES:

- A. The following standards form a part of these specifications:

American Concrete Institute (ACI)

ACI 318      Building Code Requirements for Concrete

ACI 347      Recommended Practice for Concrete Formwork

ACI 350      Environmental Engineering Concrete Structures

ACI SP-66      ACI Detailing Manual

American Society for Testing and Materials (ASTM)

ASTM	A185	Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
ASTM	A497	Specification for Welded Deformed Steel Wire Fabric for Concrete Reinforcement
ASTM	A615	Deformed Billet-Steel Bars for Concrete Reinforcement
ASTM	A775	Epoxy-coated Reinforcing Steel Bars
ASTM	A884	Epoxy-coated Welded Wire Fabric

American Welding Society (AWS)

AWS	12.1	Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction
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PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Steel reinforcing bars shall conform to ASTM A615, Grade 60, and A775 un-coated bars.
- B. Welded steel wire fabric shall conform to ASTM A185 or ASTM A497 and ASTM A884 uncoated fabric. Gauge and spacing of wires shall be as indicated on the drawings.
- C. Reinforcing steel shall be detailed in accordance with ACI SP-66 modified as applicable to conform to ACI 350.
- D. Reinforcement shall be accurately formed to the dimensions indicated on the drawings. Bars shall be shipped to the site with bars of the same size and shape, fastened in bundles with securely wired-on metal identification tags listing both size and mark.
- E. Any bar showing cracks after bending shall be discarded.
- F. Steel failing to meet the requirements of this specification or the drawings will be rejected and shall be removed from the site immediately.

### PART 3 - EXECUTION

#### 3.01 STEEL INSTALLATION:

- A. Before being placed in position, reinforcement shall be thoroughly cleaned of loose mill and rust scale, dirt, and other coatings (including ice), that reduce or destroy bond. When there is a delay in depositing concrete after reinforcement is in place, bars shall be reinspected and cleaned as necessary.
- B. After forms have been oiled, but before concrete is placed, all steel shall be securely wired in the exact position called for, and shall be maintained in that position until all concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Engineer.
- C. Concrete blocks having a minimum bearing area of 2-inches by 2-inches and equal in quality to that specified for the slab, shall be used for supporting reinforcing bars for slabs on grade. Wood blocks, stones, brick chips, etc., shall not be used to support reinforcement.
- D. Metal supports shall be of types that will not penetrate the surface of formwork or slab and which will not show through or stain surfaces that are to be exposed to view, painted or unpainted.
- E. Welding of reinforcing bars will be permitted only where permission of the Engineer has been obtained in advance. Such welding shall be performed only under conditions established by the Engineer, and in accordance with AWS 12.1.
- F. Reinforcement, which is to be exposed for a considerable length of time after having been placed, shall be painted with a heavy coat of cement grout, if required by the Engineer.

END OF SECTION

## SECTION 03 30 00

### CAST IN PLACE CONCRETE

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This Section covers all concrete and all related items necessary to place and finish the concrete work.
- B. Vault concrete cove shall be a 5000 PSI Mix. All other concrete shall be a minimum of 4000 PSI.

##### 1.02 RELATED WORK:

- A. Section 03 11 00, CONCRETE FORMWORK
- B. Section 03 21 00, CONCRETE REINFORCEMENT
- C. Section 31 00 00, EARTHWORK
- D. Items furnished under other Sections and installed under this Section include, but are not limited to:

Items embedded in concrete, including anchors, sleeves, deck drains, castings, frames for hatches, angles, nosings, and other miscellaneous metals.

##### 1.03 REFERENCES:

- A. The following standards form a part of these specifications:

#### American Concrete Institute (ACI)

- |     |     |                                                                                  |
|-----|-----|----------------------------------------------------------------------------------|
| ACI | 301 | Structural Concrete for Buildings                                                |
| ACI | 302 | Recommended Practice for Concrete Floor and Slab Construction                    |
| ACI | 304 | Recommended Practice for Measuring, Mixing, Transporting, and Replacing Concrete |
| ACI | 305 | Recommended Practice for Hot Weather Concreting                                  |
| ACI | 306 | Recommended Practice for Cold Weather Concreting                                 |
| ACI | 318 | Building Code Requirements for Reinforced Concrete                               |
| ACI | 347 | Recommended Practice for Concrete Formwork                                       |

ACI 350 Code Requirements for Environmental Engineering Concrete Structures

American Society for Testing and Materials (ASTM)

ASTM	C33	Concrete Aggregates
ASTM	C39	Compressive Strength of Cylindrical Concrete Specimens
ASTM	C42	Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM	C87	Effect of Organic Impurities in Fine Aggregate on Strength of Mortar
ASTM	C94	Ready-Mixed Concrete
ASTM	C143	Standard Method for Slumps of Portland Cement Concrete
ASTM	C150	Portland Cement
ASTM	C171	Sheet Materials for Curing Concrete
ASTM	C231	Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM	C260	Air-Entraining Admixtures for Concrete
ASTM	C309	Liquid Membrane-Forming Compounds for Curing Concrete
ASTM	C494	Chemical Admixtures for Concrete
ASTM	D1751	Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM	D1752	Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of shop drawings of the materials specified herein shall be submitted to the Engineer for review.
- B. Six copies of the statement of materials constituting the design of mixes which satisfy the specified strength for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the contract.
- C. Provide one copy of the "Certificate of Delivery" for each load of concrete as it arrives on the site, under the provisions of ASTM C94.



## PART 2 - PRODUCTS

### 2.01 CONCRETE:

- A. Concrete conforming to the requirements listed below shall be used where indicated on the drawings. Concrete used shall be a minimum of 4000 PSI.

TABLE

Minimum Comp. Strength at 28 days (psi)	Maximum Water/Cement ratio (gallons per bag of cement)*	Cement Factor: 94 lb. Bags per cubic yard minimum**
3000	0.59 (6.9)	5.5
4000	0.48 (5.6)	6.5
5000	0.40 (4.7)	7.4

\* Based on air-entrained concrete. If non-air-entrained concrete is called for, the listed maximum water/cement ratios may be increased slightly, as approved by the Engineer. The water is the total water in the mix, including free water on the aggregate.

\*\* These are minimum amounts; increase as necessary to meet mix requirements.

- B. Concrete shall conform to ASTM C94. One copy of the Certificate of Delivery required by ASTM C94 shall be delivered to the Engineer immediately upon arrival of each load of concrete at the site. The Contractor shall be responsible for the design of the concrete mixtures.
- C. Standard compression tests of all proposed mixes shall be made by the testing laboratory or other satisfactory evidence shall be presented that the design mixes will attain the minimum strengths listed on the design drawings or called for herein, within the limitations of the ACI Code. No concrete shall be delivered to the job site until the Engineer has approved the design mixes.
- D. All concrete (unless otherwise directed) shall contain an air-entraining agent. Air entrained concrete shall have an air content by volume of 3 to 6 percent for 1-1/2-inch aggregate and 4 to 8 percent for 3/4-inch aggregate. The air content shall be the responsibility of the testing laboratory and in accordance with ASTM C231.
- E. All concrete shall contain a mid-range water reducer to minimize cement and water content of the mix, at the specified slump, in accordance with ASTM C494.
- F. Slump for all concrete shall be from 3-inch to 4-inch, except for concrete using a superplasticizer, when the maximum slump shall be 8-inches. Any concrete having a

slump greater than 4-inches (8-inches with superplasticizer) shall be promptly removed from the site.

- G. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixture other than those specified shall be used in concrete without the specific written permission of the Engineer in each case.
- H. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

## 2.02 CEMENT:

- A. The cement shall be an approved brand of American manufactured Portland Cement, Type IIA conforming to ASTM C150. The brand name and type of cement proposed for use shall be submitted to the Engineer for approval immediately following award of contract. Only one color of cement, all of the same manufacture, shall be used for the work.
- B. When the use of high-early-strength Portland cement (Type IIIA) is permitted by the Engineer the same strength requirements shall apply, but the indicated strengths shall be attained in 7 days instead of 28 days.

## 2.03 ADMIXTURES:

- A. Air entraining agent shall be in accordance with ASTM C260.
- B. Water reducing agent shall be a mid-range water reducer meeting ASTM C494, Type A.
- C. Water reducing agent-retarder shall be in accordance with ASTM C494, Type D.
- D. Superplasticizer agent shall be in accordance with ASTM C494, Type F or Type G and contain no more than 0.1% chloride ions. Product may be plant added or field added based on the best application considering distance, temperature and time.

2.04 AGGREGATES:

- A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.
- B. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM C33.
- C. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33.
- D. The following designated sizes of aggregate shall be the maximum employed in concrete.

2-inch for mass concrete

1½-inch for reinforced sections 18-inch and over in thickness

¾-inch for reinforced and unreinforced sections less than 18-inch thickness.

2.05 WATER:

Water for concrete shall be potable, free from injurious amounts of oil, acid, alkali, organic matter and other deleterious substances.

2.06 GROUT:

Grout shall be mixed in the proportions of one part Portland Cement to 2 parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Aggregate for grout shall conform to the requirements of the reference specification for concrete. Prior approval of the Engineer shall be obtained for the use of proprietary grouts, and the instructions of the Engineer shall be followed in their use.

## 2.07 CURING MATERIALS:

- A. Curing compound shall be a curing/hardener compound such as Acurion by AntiHydro, Sikaguard Cure/Hard by Sika, Super Diamond Clear by Euclid or approved equal.
- B. Curing paper shall be a fiber-reinforced laminated Kraft bituminous product conforming to the requirements of ASTM C171.

## 2.08 JOINT FILLER:

- 1. Preformed joint filler strip shall conform to ASTM D1751 or D1752, having a thickness as indicated on the drawings.
- 2. Fillers shall be provided in pieces of the full thickness required. Use of multiple layers of thin pieces to make-up the full thickness will not be permitted.

## PART 3 - EXECUTION

### 3.01 GENERAL:

Under no circumstances shall concrete that has set or partially set before placing be used; and no retempering of concrete or grout will be permitted.

### 3.02 PREPARATION:

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or other material which would tend to reduce the bond.
- B. Unless otherwise indicated, a moisture barrier shall be used under all slabs placed on the ground in accordance with ACI 302.1R. The moisture barrier shall be fungi-resistant and shall have a vapor permeance rating not exceeding 0.01 perms (Perms [grains/ft<sup>2</sup>\*hr\*in. Hg]) per ASTM F1249 or ASTM E96) and 10 mils thickness (49 lbs/MSF). The moisture barrier shall be a high-performance underslab vapor retarder made from polyethylene resins that exceed ASTM E1745, Class A. Sheets shall be lapped 6-inches at joints and sealed with 2-inch wide tape or as recommended by the manufacturer. The vapor barrier should have all laps, seams, penetrations and terminations sealed and should carry across footings.
- C. When no moisture barrier is used, the earth, concrete, masonry, or other water-permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed. No concrete shall be placed until the consolidation

of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

- D. When joining fresh concrete to concrete which has attained full set, the latter shall be cleaned by chipping and washing off all dirt and scum and laitance. It then shall be moistened prior to placing new concrete.
- E. Concrete surfaces that act as a seat for structural members (other than those resting on grout) shall be troweled to an extremely flat and level surface. If necessary, such surfaces shall be ground off to achieve the required flatness and level.
- F. Fill concrete on top of concrete shall be placed in the locations indicated on the drawings or designated by the Engineer. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set. Fill concrete shall be brought to the lines and grades shown on the drawings or approved by the Engineer.
- G. Concrete for thrust and anchor blocks shall be placed against undisturbed earth and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints. Minimum bearing areas and dimensions shall be as shown on the drawings.

### 3.03 MIXING:

- A. Concrete shall be ready-mixed, or transit-mixed, as produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Adding water in controlled amounts during the mixing cycle shall be done only with the express approval of, and in the presence of the Engineer.
- B. Ready-mix or transit-mixed concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of rated capacities for the respective conditions as stated on the nameplate. Discharge at the site shall be within 1-1/2 hours after cement was first introduced into the mix. Central mixed concrete shall be plant-mixed a minimum of 1-1/2 minutes per batch and then shall be truck-mixed or agitated a minimum of 8 minutes. Agitation shall begin immediately after the pre-mixed concrete is placed in the truck and shall continue without interruption until discharge. Transit-mixed concrete shall be mixed at mixing speed for at least 10 minutes immediately after charging the truck, followed by agitation without interruption until discharged.
- C. All central plant and rolling stock equipment and methods shall conform to the latest Truck Mixer and Agitator Standards of the Truck Mixer Manufacturers' Bureau of the National Ready-Mixed Concrete Association, as well as ACI 304 and ASTM C94.
- D. Attention is called to the importance of dispatching trucks from the batching plant so that they shall arrive at the site of the work just before the concrete is required, thus avoiding

excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

### 3.04 INSTALLATION/APPLICATION/ERECTION:

#### A. Placing

1. No concrete shall be placed by pumping methods without the prior written approval of the Engineer. Should the Contractor be allowed to place concrete by pumping methods, procedures, mix design of concrete, and all other precautions shall be in accordance with ACI 304.2R and as approved by the Engineer.
2. Concrete shall be placed in alternate areas, as defined by the construction and control joints indicated on the design drawings. A minimum of 3 days shall elapse between placement of adjacent sections.
3. Segregation of the concrete shall be prevented during handling; should any segregation occur, the concrete shall be remixed before it is placed. Concrete shall be placed in the forms in horizontal layers not over 1 to 2 feet thick. Concrete shall not be allowed to drop freely more than 4 feet. If the free drop to the point of placement must exceed 4 feet, the Contractor shall obtain the approval of the Engineer for the proposed method of depositing the concrete. The concrete shall not be required to flow over distances greater than 3 feet in any direction in the forms or on the ground, unless otherwise permitted by the Engineer.
4. Unless otherwise noted, the work begun on any day shall be completed in daylight of the same day.
5. "Cold Joints" are to be avoided, but if they occur, they are to be treated as bonded construction joints.
6. Chutes for conveying concrete shall be of U-shaped design and sized to insure a continuous flow of concrete. Flat (coal) chutes shall not be employed. Chutes shall be metal or metal-lined, and each section shall have approximately the same slope. The slope shall not be less than 25 nor more than 45 degrees and shall be such as to prevent segregation of the ingredients. The discharge end of the chute shall be provided with a baffle plate or spout to prevent segregation. If the discharge end of the chute is more than 5 feet above the surface of the concrete in the forms, a spout shall be used and the lower end maintained as near the surface of deposit as practicable. When the operation is intermittent, the chute shall discharge into a hopper. Chutes shall be thoroughly cleaned before and after each run, and the debris and any water shall be discharged outside the forms. Concrete shall not be allowed to flow horizontally more than 5 feet.
7. Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools. Internal type mechanical vibrators shall be employed to produce the required quality of finish. Vibration shall be done by experienced operators under close supervision and shall be carried on long enough to produce homogeneity and optimum consolidation without permitting segregation of the

solid constituents or "pumping" or migration of air. All vibrators shall be supplemented by proper wooden spade puddling adjacent to forms to remove included bubbles and honeycomb. This is essential for the top lifts of walls. All vibrators shall travel at least 10,000 rpm and be of adequate capacity. At least one vibrator shall be used for every 10 cubic yards of concrete per hour. In addition, one spare vibrator in operating condition shall be on the site.

8. Concrete slabs on the ground shall be well-tamped into place and foundation material shall be wet, tamped, and rolled until thoroughly compacted prior to placing concrete.
9. Concrete shall be deposited continuously in layers of such thickness that no concrete will be deposited on concrete that has hardened sufficiently to cause the formation of seams and planes of weakness within the section. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer.
10. Chutes, hoppers, spouts, adjacent work, etc., shall be thoroughly cleaned before and after each run, and the water and debris shall not be discharged inside the form.

#### B. Concrete Placing During Cold Weather

1. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both. No accelerant shall be used to prevent freezing.
2. The temperature of concrete surfaces shall not be permitted to drop below 50°F. for at least 7 days after placement of the concrete.
3. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

#### C. Concrete Placing During Hot Weather

1. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays that will result in excessive mixing of the concrete after arrival on the job.
2. During periods of excessively hot weather (90°F, or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with

the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement will not be acceptable, and will be rejected.

3. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. The record shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

#### D. Pipes And Embedded Metals

1. Special care shall be taken to bring the concrete into solid contact with pipes and iron work embedded in the walls and floors, particularly underneath and around all pipes where a head of water exists, making watertight joints.
2. In general, such embedded items are not shown on the structural design drawings. Design drawings of the other trades shall be consulted for their location and details.
3. Anchor bolt location, size and details shall be verified with the equipment manufacturer's certified drawings before installation.
4. Anchor bolts, reglets, sleeves, edge angles and similar embedded items will be provided, delivered to the site under other Sections of the specification, for installation under this Section.
5. Where edge angles, etc., have nuts welded on to receive machine screws, the threads of the nuts shall be protected from concrete, and the concrete shall be excluded from the space to be occupied by the screw, by the use of wood plugs or other effective means.
6. Inserts required for hanging mechanical and electrical items shall be provided and installed in the forms under the mechanical and electrical sections of the specification.
7. Should the Contractor be allowed to leave openings in the concrete for pipes or ironwork, to await the arrival of items that would delay the prosecution of the work, the openings shall be subject to the approval of the Engineer. Appropriate construction joints shall be provided. In filling any such openings with concrete, a mixture of 1: 1-1/2 : 3 shall be used and a watertight bond shall be secured between the old and new concrete.
8. In bolting miscellaneous items to concrete after the concrete has set, expansion bolts of an approved pattern and type shall be used. The Contractor shall submit to



the Engineer, for approval, the types of expansion bolts. Expansion bolts shall not be used until they are approved.

E. Curing

1. Concrete curing shall be performed as specified in ACI 301 and as stated herein. All curing procedures shall have prior approval of the Engineer.

2. Concrete Floors

Concrete floors which are to receive paint, concrete fill, mortar setting beds, grout fill, or any other subsequent finish shall be cured by one of the following procedures immediately after completion of placement and finishing:

- a. Ponding or continuous sprinkling.
  - b. Application of absorptive mats or fabric kept continuously wet.
  - c. Application of sand kept continuously wet.
  - d. Application of waterproof sheet materials conforming to ASTM C171.
  - e. Application of curing compounds conforming to ASTM C309, if it can be demonstrated to the Engineer's satisfaction that the compound is applicable and that it will not prevent bonding of the subsequent finish to be received.
3. Curing procedure shall be continued for at least 7 days.
    - a. Moisture loss from surface placed against metal or wood forms shall be minimized by keeping forms wet until removal.
    - b. Curing shall be continued for at least 7 days. When forms are removed during the curing period, surfaces shall be cured by spraying or by the use of a curing compound as previously specified.
    - c. Surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary, 1/2-inch thick plywood sheets shall be used to protect the exposed surface.
    - d. Compound shall be placed at a rate of 200 square feet per gallon, in two applications perpendicular to each other.

F. Bracing And Supports

1. All concrete members shall be adequately and safely supported and braced until the permanent supports and braces are installed.

2. Backfilling against exterior walls shall not be done until supporting slabs are in place and have attained 70 percent of design strength, otherwise walls shall be braced against earth lateral pressure, using a system approved by the Engineer.
3. Backfilling against retaining walls shall not commence until the wall concrete has reached its 28-day strength.

#### G. Removing Forms And Supports

1. Removal of forms shall take place in accordance with ACI 347, Section 3.6. Except as otherwise specifically authorized by the Engineer, forms shall not be removed until the concrete has aged for the following number of day-degrees or attained 50 percent strength. (Day-degrees equals the total of number of days times the average daily air temperature at the surface of concrete. For example, 5 days at a daily average temperature of 60°F. equals 300 day-degrees.)

<u>Location</u>	<u>Day-Degrees</u>
Beams and Slabs	500
Walls and Vertical Surfaces	200

2. Shores under beams and slabs shall not be removed until the concrete has attained at least 70 percent of the specified cylinder strength and also sufficient strength to support safely its own weight and the construction loads upon it.

#### H. Patching

1. Defective concrete and honeycombed areas as determined by the Engineer shall be chipped down reasonably square and at least one-inch deep to sound concrete by means of hand chisels or pneumatic chipping hammers. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly imbedded in the parent concrete, subject to Engineer's final inspection. If honeycomb exists around reinforcement, chip to provide a clear space at least 1-inch wide all around the steel. For areas less than 1-1/2 inches deep, the patch may be made following the procedure for filling form tie holes, described in the subsection below, using adequately dry (non-trowelable) mixtures to avoid sagging. Thicker repairs will require build-up in 1-inch layers on successive days. Unless otherwise indicated, thicker repairs shall be made with Vertipatch mortar mixture blended with Acryl-Set, both by Master Builders, Inc., Cleveland, Ohio, or approved equal.

2. For concrete areas exposed to serious abrasion and/or impact forces, the Engineer may order the use of grout with a non-shrink metallic aggregate (Embeco by Master Builders, Inc.; Ironite by Fox Industries, Madison, IL; or approved equal) as an additive in the proportions listed below:

Material	Small Patches		Large Formed Patches	
	Volumes	Weights	Volumes	Weights
Cement	1.0	1.0	1.0	1.0
Metal Aggregate	0.15	0.25	0.2	0.33
Sand	1.5	1.5	1.5	1.0
Pea Gravel	--	--	1.5	1.5

#### I. Finishing Of Formed Surfaces

1. All concrete that is to be left exposed to view shall be scraped to remove projecting imperfections left by voids in the forms.
2. In addition to scraping, exterior exposed concrete shall be covered with a cement-base plaster mix. The mix shall consist of Thoroseal Plastic Mix and Acryl 60, as manufactured by Standard Drywall Products, Miami, FL, or approved equal. It shall be mixed and applied in accordance with the manufacturer's recommendations.
3. In addition to scraping, interior concrete surfaces which will be exposed to view and concrete surfaces which are to be prepared and painted as specified in Section 09 90 01, SWIMMING POOL PAINTING, shall receive a smooth rubbed finish, in accordance with ACI 301 and as described below.
4. To permit satisfactory finishing, forms shall be removed from the vertical faces of the concrete as early as is possible without damaging the surface. Immediately after stripping forms, any fins or projections left by the forms shall be chipped off, and the surfaces rubbed smooth.
5. Form tie holes and other voids and faults shall be patched. Voids shall be cleaned out, roughened, thoroughly wetted, coated with neat cement paste, and filled with mortar of cement and sand in the same proportions, materials, and color as used in the concrete. The surface of the patch shall be flush with the surrounding surface after finishing operations are complete. Surface shall be kept continuously damp until patches are firm enough to be rubbed without damage.
6. Rubbing shall be performed while the surface is wet using a carborundum or cement sand brick, to achieve a smooth uniform, even textured finish. Patched and chipped areas shall be blended to match as closely as possible the appearance of the rest of the surface. No cement wash or plastering will be permitted, and no mortar shall be used except as required above.
7. Where finishing is performed before the end of the curing period, concrete shall under no circumstances be permitted to dry out, and shall be kept continuously

moist from time of placing until end of curing period, or until curing membrane is applied.

J. Concrete Floor Finishing Requirements

Unless designated otherwise, concrete floors shall have a troweled finish as specified in Section 11.7 of ACI 301. Troweled finishes shall conform to the requirements of "Class A Tolerances," Section 11.9 as specified in ACI 301.

L. Testing

1. The Contractor shall provide all field testing and inspection services, and shall pay for all such services. The Engineer shall approve the testing laboratory and shall inform the Contractor when samples are to be taken for testing. The Contractor shall forward all test results to the Engineer as soon as they are available.
2. At least one slump test shall be performed from each truckload of concrete. The sample for slump shall be taken from the middle third of a truckload. Air content tests shall be made at the discretion of the Engineer. If the measured slump or air content falls outside the specified limits, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed the requirements of the specification and shall be immediately removed from the jobsite to be discarded.
3. The Contractor shall advise the Engineer of his readiness to proceed with concrete placement at least one working day prior to each placement. The Engineer will inspect the preparations for concrete, including the preparation of previously placed concrete, the reinforcing, and the alignment and tightness of formwork. No placement shall be made without the prior approval of the Engineer.
4. A minimum of four standard compression test cylinders shall be made and tested for each 100 cubic yards or fraction thereof for each type and design strength of concrete from each day's placement of concrete. One cylinder shall be tested at 7 days and two cylinders at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. The Engineer reserves the right to require test cylinders to be made for each truckload of concrete if the nature of the project or project experience indicates such additional tests are required for proper control of concrete quality; Concrete testing shall be paid for by the Contractor.
5. The strength level shall be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified strength  $f'_c$ , and no individual strength test (average of two cylinders) result falls below the specified strength  $f'_c$  by more than 500 psi.
6. In the event the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days.

## M. Failure To Meet Requirements

1. The Engineer shall have the right to reject concrete represented by low strength tests or to agree to further testing of the concrete. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected or additional tests shall be conducted shall be final. All direct and indirect costs associated with further curing and testing of the concrete shall be at the Contractor's expense. All costs associated with removing rejected concrete, placing new concrete, and conducting tests on new concrete shall be at the Contractor's expense.
2. If the Engineer agrees to consider further curing and/or testing of the concrete before making a final decision, the Contractor shall submit a detailed plan to the Engineer, including proposed criteria for acceptance of the concrete. The plan may include additional curing of the concrete, drilling and testing of cores, load testing of the structure, or a combination.
3. If additional curing is permitted before further inspection and testing, the Contractor shall provide any necessary materials and labor to further cure the suspect concrete.
4. If drilling and testing of cores is permitted, the Contractor shall be responsible for obtaining the cores, including provision of ladders, scaffolding, and such incidental equipment as may be required. If additional curing is permitted, cores shall be drilled after the curing period, and shall be in accordance with ASTM Methods C39 and C42. The Contractor shall repair all core holes to the satisfaction of the Engineer.
5. The burden of proof, including, but not limited to the work of cutting and testing the cores, inspection, evaluation, engineering, repair of the holes, or removal and replacement of the concrete in question, and all associated costs therefor, shall be at the expense of the Contractor.
6. If load testing of the concrete is permitted, and if not otherwise indicated, slabs or beams under load test shall be loaded with their own weights plus a superimposed load of 2 times the design live load. The load shall be applied uniformly over the portion being tested in the approved manner and left in position for 24 hours. The structure shall be considered satisfactory if deflection "D" in feet, at end of 24-hour period, does not exceed the following value:

$$D \text{ equals } 0.001 (L \times L)/t$$

in which "L" is span in feet, "t" is depth of slab, or beam in inches. If deflection exceeds "D" in the above formula, the concrete shall be considered faulty unless within 24 hours after removal of the load, the slab, or beam under test recovers at least 75 percent of the observed deflection.

7. If the suspect concrete still fails to meet specification requirements, the Engineer

shall have the right to reject the concrete, have it removed and replaced, in accordance with paragraph 5 above, or to require mechanical strengthening of the concrete to satisfy project requirements. The Contractor shall submit a removal and replacement plan for review by the Engineer.

END OF SECTION

## SECTION 03 37 13

### SHOTCRETE

#### PART 1 – GENERAL

##### 1.1 WORK INCLUDED

- A. Shotcrete applied by dry-mix or wet-mix process, as shown on the drawings and as specified herein, and includes, but is not limited to the following:
- B. Furnishing, placing, curing and finishing of all reinforced Shotcrete work.
- C. Furnishing, erection and removal of formwork and shoring.
- D. Furnishing and placing of reinforcing steel and related accessories.
- E. Furnishing and installation of weirs, piping, connection bars and fasteners.
- F. Furnishing and installation of railing anchor sockets, and shotcrete steps.
- G. Furnishing and installation of joint fillers.
- H. Coordination with all other trades for locating of all pipe sleeves, duct openings, keys, chases, electrical boxes and conduits, anchors, inserts, fastenings and other devices required by other trades.
- I. Wet cure of exposed shotcrete for ten days.
- J. Shotcrete fill for stair treads and landings.
- K. Shotcrete for encasement of main drains and PVC floor return pipes and inlets.
- L. Finish of shotcrete surfaces acceptable for paint or Plaster finish as specified.
- M. Dewatering of site during shotcrete operation as required to keep excavation dry and free of groundwater.

##### 1.2 RELATED SECTIONS

- A.
  - 1. Section 03 21 00, CONCRETE REINFORCEMENT
  - 2. Section 09 22 00, PLASTER
  - 3. Section 13 00 00, SUMMARY OF WORK FOR WATER FEATURES

### 1.3 REFERENCES

#### A. American Concrete Institute (ACI):

1. ACI 117R - Specifications for Tolerances for Concrete Construction and Materials.
2. ACI 301 - Specifications for Structural Concrete.
3. ACI 305R - Hot Weather Concreting.
4. ACI 306.1 - Specification for Cold Weather Concreting.
5. ACI 506R - Guide to Shotcrete.
6. ACI 506.2 - Specification for Shotcrete.

#### B. ASTM International (ASTM):

1. ASTM A 36 - Specification for Carbon Structural Steel.
2. ASTM A 82 - Specification for Steel Wire, Plain, for Concrete Reinforcement.
3. ASTM A 153 - Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A 185 - Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
5. ASTM A 307 - Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
6. ASTM A 497 - Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
7. ASTM A 615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
8. ASTM A 706 - Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
9. ASTM A 767 - Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
10. ASTM A 820 - Specification for Steel Fibers for Fiber Reinforced Concrete.
11. ASTM C 33 - Specification for Concrete Aggregates.



12. ASTM C 42 - Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
13. ASTM C 150 - Specification for Portland Cement.
14. ASTM C 171 - Specification for Sheet Materials for Curing Concrete.
15. ASTM C 173 - Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
16. ASTM C 231 - Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
17. ASTM C 260 - Specification for Air-Entraining Admixtures for Concrete.
18. ASTM C 309 - Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
19. ASTM C 494 - Specification for Chemical Admixtures for Concrete.
20. ASTM C 618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
21. ASTM C 979 - Specification for Pigments for Integrally Colored Concrete.
22. ASTM C 1064 - Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
23. ASTM C 1077 - Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation.
24. ASTM C 1116 - Specification for Fiber-Reinforced Concrete and Shotcrete.
25. ASTM C 1141 - Specification for Admixtures for Shotcrete.
26. ASTM C 1240 - Specification for Silica Fume for Use as a Mineral Admixture in Hydraulic Cement Concrete, Mortar, and Grout.
27. ASTM D 1751 - Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
28. ASTM D 1752 - Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
29. ASTM E 329 - Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

C. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice.
2. SSPC: The Society for Protective Coatings.
3. SSPC-SP 6/NACE No. 3 2000 - Joint Surface Preparation Standard SSPC-SP 6/NACE No. 3: Commercial Blast Cleaning.

#### 1.4 DEFINITIONS

- A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.
- B. Dry-Mix Shotcrete (Base Bid): Shotcrete with most of the water added at nozzle.
- C. Wet-Mix Shotcrete (Alternate Bid): Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose or supplied by ready mix company.

#### 1.5 SUBMITTALS

- A. Submit under provisions of Section 01 33 00 - Submittal Procedures.
- B. Product Data: Submit for manufactured materials and products including reinforcement and forming accessories, shotcrete materials and curing compounds.
- C. Shop Drawings: Submit for details of fabricating, bending, and placing reinforcement. Include support and anchor details, number and location of splices, and special reinforcement required for openings through shotcrete structures.
- D. Design Mixes: For each shotcrete mix.
- E. Quality Assurance/Control Submittals:
  1. Submit manufacturer's certificates that products meet or exceed specified requirements.
  2. Submit test results prepared by a qualified independent testing laboratory.

#### 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm specializing in manufacture of shotcrete materials, with minimum 10 years' experience.
- B. Quality Assurance/Control Testing: Test Reports prepared by a qualified independent laboratory indicating compliance with the following performance requirements:
  1. ACI 301, Specifications for Structural Concrete.
  2. ACI 506.2, Specification for Shotcrete.

- C. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- D. Pre-Installation Meeting: At least three weeks prior to commencing masonry work conduct a meeting at the project site to discuss contract requirements and job conditions; require the attendance of contractor, and installers of related materials; notify Engineer in advance of meeting.

## 1.7 PROJECT CONDITIONS

- A. Cold-Weather Shotcreting: Protect shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according to ACI 306.1 and as follows:
  - 1. Discontinue shotcreting when ambient temperature is 40 deg. F and falling. Uniformly heat water and pre-packaged materials before mixing to obtain a shotcrete shooting temperature of not less than 50 deg. F and not more than 90 deg. F.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
  - 4. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
- B. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 506R when hot weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:
  - 1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg. F for dry mix or 90 deg. F for wet mix.
  - 2. Reduce temperature of reinforcing steel and receiving surfaces below 100 deg. F before shotcreting.
- C. Contractor shall submit to the Engineer a minimum of 21 days prior to the pour the proposed method of curing the placed shell for either hot weather or cold weather curing.

## PART 2 – PRODUCTS

### 2.1 FORM MATERIALS

- A. Forms: Form facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practicable sizes to minimize number of joints.

### 2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60 (Grade 420), deformed.

- B. Plain-Steel-Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- C. Deformed Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- D. Supports: Bolsters, chairs, spacers, ties, and other devices for spacing, supporting, and fastening reinforcing steel in place according to CRSI's "Manual of Standard Practice" and as follows:
  - 1. For uncoated reinforcement, use CRSI Class 1, plastic-protected bar supports.
- E. Reinforcing Anchors: ASTM A 36, un-headed rods or ASTM A 307, Grade A, hex-head bolts; carbon steel; and carbon-steel nuts.
  - 1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- F. Epoxy coated rebar shall be rejected.

### 2.3 SHOTCRETE READY MIXED

- A. Ready Mixed Concrete: Except as otherwise provided in these specifications, ready mixed concrete shall be batched, mixed, and transported in accordance with "Specifications for Ready Mixed Concrete" (ASTM C-94).
- B. Mixing Water Control:
  - 1. Concrete which arrives at the site with slump below that suitable for placement may be adjusted by the addition of water to increase slump provided that the maximum slump is not exceeded. Any addition of water to increase slump shall be followed by mixing of at least 30 revolutions of the drum.
  - 2. After adjustment to the proper slump, discharging shall be allowed for as long as the concrete retains its workability without the addition of water.
  - 3. Compressive strength of the mixture shall be 4500 PSI after 28 days.

### 2.4 SHOTCRETE MATERIALS DRY PROCESS

- A. SPECPOOLShotcrete: SPEC MIXSPECPOOLShotcrete is a pre-blended, high early strength, cement-based product containing Portland cement, aggregate (ACI Gradation 1, 2 or 3), fly ash, silica fume, steel or synthetic fibers, and chemical admixtures specifically designed for use in pool construction.
  - 1. Coloring Agent: ASTM C 979, synthetic mineral-oxide pigments or colored, water-reducing admixtures, color stable, nonfading, and resistant to lime and other alkalis.
  - 2. Applicable Standards: ASTM A 820, ASTM C 33, ASTM C 150, ASTM C 260, ASTM C 494, ASTM C 618, ASTM C 1116, ASTM C 1141, ASTM C 1240, ACI 506.2.

3. Or approved equal.

## 2.5 SHOTCRETE READY MIXED

- A. Ready Mixed Concrete: Except as otherwise provided in these specifications, ready mixed concrete shall be batched, mixed, and transported in accordance with "Specifications for Ready Mixed Concrete" (ASTM C-94).
- B. Mixing Water Control:
  1. Concrete which arrives at the site with slump below that suitable for placement may be adjusted by the addition of water to increase slump provided that the maximum slump is not exceeded. Any addition of water to increase slump shall be followed by mixing of at least 30 revolutions of the drum.
  2. After adjustment to the proper slump, discharging shall be allowed for as long as the concrete retains its workability without the addition of water.

## 2.6 ACCESSORY MATERIALS

- A. Water: Clean and free from deleterious acids, alkalis, and organic matter.
- B. Ground Wire: High-strength steel wire, 0.8 to 1 mm in diameter.
- C. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

## 2.7 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Clean and free from deleterious acids, alkalis, and organic matter.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

## 2.8 SHOTCRETE MIXTURES, GENERAL

- A. Prepare design mixes for each type and strength of shotcrete.
- B. Design-Mix Adjustments: Subject to compliance with requirements, shotcrete design-mix adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

## 2.9 SHOTCRETE MIXTURES

- A. Mix pre-packaged shotcrete materials with water either in dry mix or wet mix process to provide shotcrete with the following properties:
  - 1. Compressive Strength (28 Days): 4500 psi.
  - 2. If pre-packaged, air-entrained mixtures are selected, verify that normal-weight, wet-mix shotcrete has an air content before pumping of 8 percent with a tolerance of plus or minus 1 percent.
  - 3. Water: Cement Ratio – All concrete shall have a maximum water-cement ratio of 0.45%. This is total water in mix at time of placement, including free water of aggregates and liquid admixtures.
  - 4. Slump of concrete:
    - a. Walls: Minimum 1 inch, maximum 3 inches
    - b. Floors: 4 inches
    - c. Slab-on-metal forms: 3 inches
  - 5. Pre-mix admixtures in solution form and dispense as recommended by the manufacturer. Include the water in the solution in the design water content of the mixtures.

## 2.10 SHOTCRETE EQUIPMENT

- A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.
- B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.
  - 1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
  - 2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.
- C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

## 2.11 MIXING

- A. Dry-Mix Process: Dampen pre-packaged shotcrete materials and thoroughly mix prior to use.
  - 1. Verify with manufacturer the water mix ratio at head to achieve specified mix design prior to application.
- B. Wet-Mix Process: Thoroughly mix clean water with pre-packaged shotcrete materials in batch mixer prior to use.
  - 1. Verify with manufacturer quantity of water to be added to batch to achieve specified mix design.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Concrete or Masonry: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces before shotcreting.
  - 1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.
- B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces before shotcreting.
- C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding.
- D. Steel: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

### 3.2 FORMS

- A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.
  - 1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.

2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.
- B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

### 3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.
- C. Securely embed reinforcing anchors into existing substrates, located as required.
- D. Accurately position, support, and rigidly secure reinforcement against displacement by formwork, construction, or shotcreting. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
- E. Place reinforcement to obtain minimum coverage for shotcrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during shotcreting. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.
- F. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

### 3.4 JOINTS

- A. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints, unless otherwise indicated.



- B. Contraction Joints: Construct contraction joints in shotcrete using saw cuts 1/8-inch wide by 1/3 slab depth or joint-filler strips 1/4-inch wide by 1/3 shotcrete depth, unless otherwise indicated.

1. After shotcrete has cured, remove strip inserts and clean groove of loose debris.
2. Space joints at as shown on the contact plans, horizontally and vertically.
3. Tool edges round on each side of strip inserts if floated or troweled finishes are required.

### 3.5 ALIGNMENT CONTROL

- A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

### 3.6 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

### 3.7 APPLICATION

- A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.
- B. Moisten substrate immediately before placing shotcrete.
  1. Moisten wood forms immediately before placing shotcrete where form coatings are not used.
- C. Provide a platform that permits nozzleman unobstructed access to the receiving surface. Place shotcrete first in corners, recesses, and other areas where rebound or overspray cannot escape easily.
- D. Apply shotcrete according to ACI 506.2.
- E. Apply dry-mix shotcrete materials within 45 minutes after pre-dampening and wet-mix shotcrete materials within 90 minutes after batching.
- F. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.
  1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

- G. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent buildup against front face during shotcreting.
- H. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.
- I. Do not apply shotcrete on surfaces with standing water or running water.
- J. Place shotcrete to completely encase reinforcing steel. Encase reinforcement by shooting with sufficient velocity and plasticity so material flows around and behind the reinforcement. Front face of reinforcement shall remain clean during encasement.
- K. Place shotcrete to provide the cover over reinforcement required by ACI 301 or as otherwise detailed on drawings.
- L. Do not permit shotcrete to sag, slough, or dislodge.
- M. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.
- N. Do not disturb shotcrete surfaces before beginning finishing operations.
- O. Remove ground wires or other alignment control devices after shotcrete placement.
- P. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117R, increased by a factor of 2.

### 3.8 SURFACE FINISHES

- A. General: Finish shotcrete according to descriptions in ACI 506R for the following finishes:
- B. Natural Finish:
  - 1. Gun Finish: Natural undisturbed finish.
  - 2. Rod Finish: Rough-textured finish obtained by cutting or screeding exposed face of shotcrete to plane by rod or straightedge after initial set.
- C. Flash-Coat Finish: After screeding and rodding surface, apply up to 1/4-inch coat of shotcrete using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve to provide a finely textured finish.

- D. Flash-Coat and Final Finish: After screeding and rodding surface, apply up to 1/4-inch coat of shotcrete using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve and apply brush-float finish.
- E. Finish-Coat Finish: After screeding and rodding surface, apply shotcrete finish coat, 1/4 to 1 inch thick, using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve to provide a finish of uniform texture and appearance.
- F. Finish-Coat and Final Finish: After screeding and rodding surface, apply shotcrete finish coat, 1/4 to 1 inch thick, using ACI 506R, Gradation No. 1, fine-screened sand modified with maximum aggregate size not exceeding No. 4 sieve and apply brush-float finish.

### 3.9 CURING

- A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.
- B. Start initial curing as soon as free water has disappeared from shotcrete surface after placing and finishing.
- C. Curing Exposed Surfaces: Cure shotcrete by one of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for at least seven days with water, continuous water-fog spray, water-saturated absorptive covers, or moisture-retaining covers. Lap and seal sides and ends of covers.
  - 2. Curing Compound: Apply curing compound uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. Apply curing compound to natural or gun-finished shotcrete at rate of 1 gal./100 sq. ft.
- D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

### 3.10 FORM REMOVAL

- A. Forms not supporting weight of shotcrete may be removed after curing at not less than 50 deg. F for 24 consecutive hours after gunning, provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
  2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form facing materials are unacceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

### 3.11 FIELD QUALITY CONTROL

- A. Testing Laboratory: Independent of the Owner, Architect and Contractor; the testing laboratory, in addition to meeting requirements of ASTM E-329, and must be an approved laboratory competent to perform concrete physical testing. All tests must be performed in strict accordance with the applicable ASTM standard.
- B. Distribution of Results of Tests: Within 24 hours of results of tests, copies of the results shall be submitted to the Architect, Contractor and the supplier if applicable.
- C. Shotcrete Testing:
1. Air Content: ASTM C 173, volumetric method or ASTM C 231, pressure method; 1 test for each compressive-strength test for each mix of air-entrained, wet-mix shotcrete measured before pumping.
  2. Shotcrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 deg. F and below and when 80 deg. F and above, and 1 test for each set of compressive-strength specimens.
  3. In-Place Shotcrete: Take a set of 3 unreinforced cores for each mix and for each workday or for every 50 cu. yd. of shotcrete placed; whichever is less. Test cores for compressive strength according to ACI 506.2 and ASTM C 42. Do not cut steel reinforcement.
    - a. Strength of shotcrete will be considered satisfactory when mean compressive strength of each set of 3 unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength. Cores shall be tested at seven and twenty eight days for compressive strength.
    - b. For dry applied process, shotcrete shall be shot onto 30-inch by 30-inch panels for every 50 cubic yards placed. Four cores shall be taken from these panels and tested. Testing shall be performed in accordance to ASTM C1140. Cores shall be tested at seven and twenty eight days for compressive strength.

### 3.12 REPAIRS

- A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.
  - 1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces and apply new shotcrete.
- B. Repair core holes from in-place testing according to repair provisions in ACI 301 and match adjacent finish, texture, and color.

### 3.13 CLEANING

- A. Remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION

## SECTION 03 48 00

### PRECAST CONCRETE COLLECTOR TANK

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

This section of the specification covers the furnishing and installation of the holding tank.

##### 1.02 RELATED WORK:

- A. Section 13 00 00, SUMMARY OF WORK FOR WATER FEATURES
- B. Section 22 51 00, FOUNTAIN EQUIPMENT
- C. Section 31 00 00, EARTHWORK

##### 1.03 QUALITY ASSURANCE:

- A. The collector tank shall be tested with a static water test to ensure the tank does not leak.

##### 1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of shop drawings of the materials of this section shall be submitted to the Engineer for review.
- B. Tank drawings shall be stamped by a Registered Massachusetts Professional Engineer. They shall display that they are designed to withstand hydraulic uplift.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

- A. Collector Tank: The holding tank shall be sized in accordance with contract plans, reinforced concrete tank, having a minimum capacity of 150 gallons. Precast Concrete Collector tank shall have an H-20 minimum load rating. A cast iron cover shall be installed on top of the structure, tucked into the planter.
- B. The tank shall be constructed of 5,000 psi concrete, shall have a minimum wall thickness of 6-inches, and shall be coated with a bituminous coating on the exterior of the structure.
- C. The holding tank shall be constructed to meet or exceed a design loading class of AASHTO HS20-44.

- D. A riser section with an opening that will accommodate the existing casting found on the existing collector tank. The casting on the current collector tank shall be removed from the current tank, and reinstalled on the proposed collector tank.
- E. All tank segment seals shall be Butyl Rubber, designed for drinking water use. The Butyl Rubber seal shall be able to withstand breakdown from Sodium Hypochlorite, or Calcium Hypochlorite.
- F. All penetrations shall be sealed with a Link Seal, or approved equal. All penetrations shall have a mechanical seal.
- G. Tank shall have rubber coated ladder rungs aligned over an access hatch extending to the bottom of the tank.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. The Collector Tanks and appurtenances shall be installed in accordance with the manufacturer's instructions, as detailed on the drawings, and in accordance with local and state codes.
- B. Penetrations shall be coordinated by the Contractor.

#### 3.02 TESTING

- A. The Collector Tank shall be water tested for a 24 hour period. The tank shall be filled to the static water level proposed in the above mentioned pools. The tank shall stay at the static water level for a minimum of 24 hours. If in this time the water in the tank drops more than a 1/4-inch, the tank shall be drained, repaired, and retested until the tank complies with the above mentioned allowable loss.

END OF SECTION

## SECTION 04 01 40.61

### REPAIR EXISTING STONE MASONRY VENEER

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. Furnish all labor, materials, and equipment to complete all required to reinstall the stone masonry veneer as indicated on the drawings and in this Section.
- B. Repair of the stone walls includes:
  - 1. Catalogging of existing stone veneer. Shall be reinstalled in the exact placement as it is removed, historic photos, or by the direction of the Historical Commission.
  - 2. Supply, placement, and installation of mortar mix, as specified in this section, between and behind the stones repaired fountain.
  - 3. Preparation of the surfaces where mortar is to be applied. Preparation shall consist of drying the surfaces and removal of any deleterious materials utilizing methods approved by the Owner, Engineer, and Historical Commission.
  - 4. Pinning of the granite veneer to the concrete surface.
  - 5. Rodding the mortar after application to eliminate air pockets.
  - 6. Cleaning all the exposed surfaces.
  - 7. Reinstalling the stepping stones on the spillway with the replacement of the broken stones by the Contractor, stones shall be approved by the Historical Commission.

##### 1.02 RELATED WORK:

- A. Section 01 11 00, CONTROL OF WORK AND MATERIALS
- B. Section 03 01 30.62, REPAIR OF EXISTING CONCRETE STRUCTURE

##### 1.03 REFERENCES:

- A. American Concrete Institute
- B. ASTM C150 Portland Cement
- C. ASTM C494 Chemical Admixtures for Concrete.



#### 1.04 QUALIFICATIONS:

- A. The contractor/subcontractor conservator shall have at least ten years' experience providing masonry repair, restoration, or rehabilitation on projects in similar nature in scope and importance to the Menotomy Fountain. The contractor/subcontractor conservator should provide a resume with examples of at least five projects similar in scope and importance and the name of the conservation entity shall be included on the Bid Form where designated. The list should include names and dates of these projects as well as the names and contact information for the person or group in charge of these projects. The contractor should submit a sample treatment report and a sample of photographic documentation from a project of similar scope and importance.

#### PART 2 - PRODUCTS

##### 2.01 MATERIALS:

###### A. MASONRY CEMENT MORTAR:

The cement shall be an approved brand of American manufactured Portland Cement, Type M Mortar. Mortar shall be mixed to the specifications of ASTM C 270

1. Compressive Strength: 2500 PSI, Minimum at 28 days for laboratory mixed mortar with a flow of 110 + / -, 5 %.
2. Water Retention: 75%, minimum
3. Air Content: 18%, maximum.
4. Aggregate Ratio: No Less than 2.25 and more more 3.5 times the sum of the separate volumes of cementitious materials.
5. Bonding Agent: A bonding agent shall be applied into the mix to increase the life expectancy of air entrainment. The bonding agent shall improve durability and resistance of mortar to freeze / thaw cycles.
6. Bonding shall be applied into the Type M mortar mix, as well as a compatible bonding agent that shall be applied to the waterproofed basin prior to the installation of the masonry stone.

###### B. SIKATOP 124:

SikaTop 124 shall be as manufactured by Sika Corporation of Lyndhurst, New Jersey, or approved equal.

C. WATER:

Water for mortar shall be potable, free of deleterious materials such as oil, acid, alkali and organic matter.

D. COLORING:

Contractor shall dye the mortar color to match the earth tones in the stone. All Colors shall be selected and approved by the Historical Commission.

PART 3 - EXECUTION:

3.01 SURFACE PREPARATION:

- A. All stone wall surfaces to be repaired shall be cleaned of all dust, dirt, laitance, loose stones, and any other deleterious materials which could affect the application and bonding of mortar to the stone surfaces. All surfaces shall be cleaned and acceptable to the Engineer prior to the application of mortar.
- B. The Contractor has the option of using sand blasting techniques, chipping and washing, or other approved method, when preparing stone wall surfaces.
- C. The Contractor shall submit, a minimum of two weeks prior to commencing work, a plan detailing the proposed surface preparation method and obtain written approval from the Owner prior to commencing work.

3.02 MORTAR MIXING:

- A. The Contractor shall submit to the Owner, a minimum of two weeks prior or commencing work, a mix design suitable for the application. Mortar mixes shall include SikaTop 124, or approved equal with a minimum 28-day compressive strength of 3000 psi.

3.03 APPLICATION:

- A. Prior to application of mortar, all cleaned and approved surfaces shall be saturated with water, but shall have no standing water on the surface.
- B. Fill mortar in the voids between stones deep inside the wall. Compact the applied mortar to insure the complete filling of the voids between and behind the stones. Filling shall proceed with small amounts to insure proper compaction. Application of mortar at one area shall proceed in a continuous manner before the prior application has dried or set.

- C. All surfaces shall be cleaned after completion of the work to bring the walls back to their original appearance.

END OF SECTION

## SECTION 07 16 00

### CEMENTITIOUS WATERPROOFING

#### PART I – GENERAL

##### 1.01 WORK INCLUDED:

- A. Furnishing of all labor, materials, services and equipment necessary for the supply and installation of cementitious crystalline waterproofing to concrete substrates, found on the newly poured cast in place concrete on the floor and walls of the pool, and on pool deck, where the concrete patch was installed, as specified herein.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.”
- C. Cementitious waterproofing system shall be colored “black” for the upper and mid basin, but shall be its natural color for the lower basin.
- D. In the walls of the upper basin and mid basin, two coats maybe required for uniform color. Contractor shall provide (2) coats on the walls of the upper and mid basin. The historical commission shall review the walls prior to the second coat.

##### 1.02 RELATED WORK:

- A. Section 03 30 00, CAST IN PLACE CONCRETE

##### 1.03 REFERENCES:

- A. The following standards are referenced herein.
  - 1. American Society for Testing and Materials (ASTM)
  - 2. Army Corps of Engineers (CRD)
  - 3. American National Standards Institute (ANSI)
  - 4. NSF International
  - 5. European Standards (EN)
  - 6. RILEM
  - 7. Drinking Water Inspectorate (DWI)
- B. When reference is made to one of the above standards, the revisions in effect at the time of bid opening shall apply.

##### 1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturer's literature of the materials of this section shall be submitted to the Engineer for review.

1.05 DELIVERY, STORAGE, AND HANDLING:

- A. Materials shall be delivered to the site in the original, unopened, factory-sealed containers, bearing the manufacturer's label fully identifying the material and the producing company.
- B. Handle materials with care. Do not dump from trucks or delivery vehicles nor handle in any manner likely to cause damage.

1.06 QUALITY ASSURANCE:

- A. Materials shall not be applied in wet weather or to wet or damp surfaces. No work shall be performed when temperature is below 40 degrees Fahrenheit.
- B. Surrounding areas which are not to be coated shall be completely protected from spray, spattering, or dripping, using drop cloths or other protective measures, as required. Spillage or dripping which occurs shall be immediately and completely removed, leaving no stain. Solvents or cleaning methods shall be those recommended by the manufacturer of the material being used.

PART 2 - PRODUCTS

2.01 CEMENTITIOUS CRYSTALLINE WATERPROOFING:

- A. Concrete waterproofing and protection system shall be of the crystalline type that is a blend of Portland cement, fine treated silica sand and active proprietary chemicals. When mixed with water and applied as a cementitious coating, the active chemicals diffuse into the concrete and cause a catalytic reaction which generates a non-soluble crystalline structure within the pores and capillary tracts of concrete. This crystalline system causes the concrete to become sealed against the penetration of liquids from any direction, and protects the concrete from deterioration due to harsh environmental conditions. The system is used for above or below-grade walls and slabs, including liquid retaining structures and where enhanced chemical resistance is required.
- B. Crystalline waterproofing system shall have been tested in accordance with the following standards and conditions, and the testing results shall meet or exceed the performance requirements as specified herein.
- C. Testing shall have been performed by an accredited independent laboratory meeting the requirements of ASTM E 329 or other applicable international standard for certification of testing laboratories. Testing laboratory shall have obtained all control and treated concrete samples.
- D. Independent testing shall be performed according to U.S. Army Corps of Engineers CRD C48 "Permeability of Concrete". Concrete samples shall have design strength of 2000 psi (14 MPa) and thickness of 2 inches (50 mm). Treated samples shall have two coats of crystalline waterproofing applied per manufacturer's directions. Samples to be pressure tested to 175 psi (405 foot head of water) or 1.2 MPa (123.4 m head of water). Control samples shall leak and treated samples, after crystalline growth

has occurred, shall exhibit no measurable leakage.

- E. Independent testing shall be performed according to EN 12390–8 or other recognized direct pressure test. Concrete samples shall have a design strength of 25 MPa (3600 psi). Treated samples shall be exposed to water pressure on the side opposite to the crystalline coating. Coated samples shall exhibit a greater than 90% reduction in depth of water penetration as compared to the control samples.
- F. Independent testing shall be performed according to ASTM C 267 “Chemical Resistance of Mortars” and ASTM C 39 “Compressive Strength of Cylindrical Concrete Specimens”. Concrete samples (treated and untreated) shall have design strength of 4000 psi (27.6 MPa). Treated samples shall have two coats of crystalline waterproofing applied per manufacturer’s directions. Untreated and treated specimens must be immersed for a minimum of 84 days in following chemical solutions: hydrochloric acid (3.5 pH), brake fluid, transformer oil, ethylene glycol, toluene, caustic soda. Treated specimens shall exhibit no detrimental effects after exposure, and shall have an average.
- G. Cementitious waterproofing shall be dyed using either black oxide powder (Bayerferrox or equal) or a liquid such as a Davis or Scofield product. For the black oxide powder, dosage shall be one pound per 60 pound pail of cementitious concentrate.
- H. Acceptable Manufacturers:
  - 1. Xypex
  - 2. Flexcrete
  - 3. Multikote
  - 4. Or approved equal

### PART 3 - EXECUTION

#### 3.01 EXAMINATION:

- A. Prior to waterproofing installation, arrange visit to project site with waterproofing manufacturer’s representative. Representative shall inspect and certify that concrete surfaces are in acceptable condition to receive waterproofing treatment.
- B. Verify that concrete surfaces are sound and clean, and that form release agents and materials used to cure the concrete are fully removed.
- B. Examine surfaces to be waterproofed for defects such as honeycombing, rock pockets, faulty construction joints and cracks. Such defects to be repaired in accordance to manufacturer’s product data and 3.02 below.

### 3.02 PREPARATION:

- A. Smooth surfaces (e.g. where steel forms are used) or surfaces covered with form oil or other contaminants shall be cleaned, water-blasted, lightly sand-blasted, or acid etched as necessary to provide a clean absorbent surface. The surface must also have an open capillary system to provide “tooth and suction” for the Cementitious Waterproofing treatment. A minimum of CSP-3 per the International Concrete Repair Institute Concrete Surface Profile Chips or other equivalent standard is required. Surfaces to be acid-etched shall be saturated with water before application of the acid. After acid etching flush concrete thoroughly with clean water. Horizontal surfaces shall have a rough wood float or broom finish. Where a smooth trowel finish is required on horizontal surface, crystalline waterproofing material shall be applied by dry shake method at time of concrete finishing in accordance with manufacturer’s product data.
- B. Concrete defects shall be repaired in accordance with manufacturer’s technical literature including relevant Method Statements. Procedures are generally as follows:
  - 1. Cracks and Faulty Construction Joints:
    - a. Chip out cracks, faulty construction joints and other defects to a depth of 1.5 inches (37 mm) and a width of one inch (25 mm). A “V” shaped slot is not acceptable. The slot may be saw cut instead of chipped but ensure that the slot is dovetailed or otherwise shaped such that there will be mechanical interlock of materials placed into the slot at a later stage.
    - b. Clean slot of debris and dust. Soak area with water and remove excess surface water. Apply a slurry coat of Concentrate at the rate of 1.5 lb./sq. yd. (0.8 kg/m<sup>2</sup>) to the slot.
    - c. While slurry coat is still tacky, fill cavity with Crystalline product. Compress tightly into cavity using pneumatic packer or block and hammer.
  - 2. Rock Pockets, Honeycombing or other defective concrete: All areas of poor concrete consolidation (honeycomb or rock pockets) shall be repaired.
- C. Cementitious Waterproofing requires a saturated surface dry (SSD) substrate. Concrete surfaces must be thoroughly saturated with clean water prior to the application so as to aid the proper diffusion of the Cementitious Waterproofing chemistry and to ensure the growth of the crystalline formation deep within the pores of the concrete. Remove excess water before the application such that there is no glistening water on the surface. If concrete dries out before application, it must be re-wetted.

### 3.03 CLEANING AND PROTECTION:

- A. Clean spillage and soiling from adjacent surfaces using appropriate cleaning agents and procedures.

- B. Take measures to protect completed cementitious waterproof coating until the coating is hard enough to not be damaged. In normal conditions protect from pedestrian traffic for 3 days and vehicular traffic for 7 days.

END OF SECTION



## SECTION 07 90 00

### WATERSTOP & SEALANTS FOR FOUNTAIN

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. Furnish all materials, equipment, labor and services required for all waterstops, caulking, reinforced PVC waterproof membrane and sealants.
- B. Include sealants, joint backup, primers, elastomeric and PVC waterstop.
- C. Waterstop and sealants are required on all concrete containment curbs, and where fountain walls meet fountains poured-floor, fountain walls meet fountain walls, floor-to-floor, at all tank walls, fountain supports and manholes, at any construction or expansion joint, and as shown on the drawings.
- D. Furnish and install waterproof coating and sealants for fountain.
- E. See drawings for locations and additional details.
  - 1. Furnish, install, and maintain all staging, scaffolding, and hoisting required for this work.

##### 1.02 RELATED WORK:

- A. The related work shall be performed under other Sections:
  - 1. Section 03 30 00, CAST IN PLACE CONCRETE

##### 1.03 QUALITY ASSURANCE:

- A. Materials used in fulfilling the requirements of this Section shall be suitable for each intended use and shall be of the type specified for each category. Materials shall be applied under temperatures required for each type in accordance with the manufacturer's recommendations.
- B. In addition to other requirements, compounds shall contain no acid or ingredients that will affect masonry, corrode metal, or have injurious effects on paint.
- C. Use proper materials specified herein for each location where drawings call for sealants.
- D. Submit manufacturer's certification of compliance with these specifications for each material. (Acceptable for use in fountains.)

1.04 REFERENCES:

- A. Work shall conform to codes and standards of the following agencies as further cited herein:
  - 1. Federal Specifications published by the United States Government, available from General Services Administration, Specification and Consumer Information Distribution Service, Washington Navy Yard Building 197, Washington, DC.

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Six sets of manufacturer's literature of the materials of this section shall be submitted to the Engineer for review.

1.06 SAMPLES:

- A. Submit samples of all products listed in Part 2 - PRODUCTS.
- B. Sealant samples shall be 3-inch strips joining wood, metal or hardboard. Joint backup sample shall be 6-inches long, ½-inch or greater in diameter. Foam sealant shall also be 6-inches long.
- C. Submit manufacturer's product description, performance and test data on all materials, for Engineer's review.
- D. Colors of all materials shall be as selected.

1.07 DELIVERY, STORAGE AND HANDLING:

- A. Each container shall bear an unbroken seal, test number and label of the manufacturer upon delivery at the site. Unlabeled materials will be rejected and shall be removed from the site and replaced with approved-labeled materials at no additional cost to the Owner.
- B. Deliver materials to site and install work under this Section in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts.
- C. Store waterstop materials under tarps to protect from oil, dirt and sunlight.

1.08 GUARANTEES:

- A. Attention is directed to provisions of the GENERAL CONDITIONS regarding guarantees and warranties for work under this Contract.

- B. Manufacturers shall provide their standard guarantees for work under this Section. However, such guarantees shall be in addition to and not in lieu of all other liabilities which manufacturers and Contractor may have by law or by other provisions for the Contract Documents.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

#### A. Sealants

1. Sealants shall be non-staining materials conforming to the requirements of United States of America Standards Institute "Standard Specification for Polysulfide-Base Sealing Compounds for the Building Trade", USA 116.1. Compound shall be Class A (self-leveling), or Class B (non-sag), as applicable in each case for the joint to be caulked. Color of sealant shall match as closely as possible the color of the surrounding materials, and when used adjacent to masonry work the compound shall match the color of the mortar in the masonry joints. Precise color shall in all cases be subject to the approval of the Engineer.

- a). Dow Corning Corporation: 790
- b). Pecora Coproration: 890 NST
- c). Tremco Incorporated: Spectrem 1

### 2.03 JOINT – SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

### 2.04 FOUNTAIN DECK AND FOUNTAIN JOINT SUBMERGED CAULKING

- A. The product specified herein is to establish minimum acceptable quality. Product shall be resistant to chlorides, and shall come in various colors:

- Tough, elastic, rubber-like seal.
- Remains flexible with expansion and contraction of building component without adhesive or cohesive failure, under suitable design conditions.
- Stays resilient within a wide temperature range.
- Excellent resistance to water, oils, grease, most solvents, mild acids and alkalis.
- Tenacious adhesion to concrete, metal, wood, glass, stone, ceramic and masonry surfaces in any combination, typically without the need for priming.
- Effective under constant immersion or saturated conditions, when suitably primed.
- USDA acceptance (NS grade only).

**B. APPROVED MANUFACTURES:**

1. Sika
2. Euclid
3. BASF
4. Approved Equal

C. Joint primer shall be for concrete or as recommended by the caulking manufacturer.

**2.05 MISCELLANEOUS MATERIALS**

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealants to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## 2.06 WATERSTOPS:

- A. Waterstop manufacturer shall demonstrate five years (minimum) continuous, successful experience in production of Waterstop.
- B. Caulking applied waterstop shall be a hydrophilic waterstop in a cartridge. Hydrophilic waterstop shall be a water-swelling single component elastic sealant. It shall swell up to 2x the original size in the presence of water. It shall be installed to provide a minimum of 3" of clear concrete cover over the sealant bead. The bead shall be a minimum of 1/2" x 1/2" bead. Product shall be manufactured by Adeka, model no P201, or approved equal.
- C. Provide flexible PVC (polyvinyl chloride) waterstop as manufactured by Greenstreak or approved equal, profile style number (717 ribbed with center bulb 6-inch for interior fountain application, and 701 ribbed with center bulb 4-inch for gutter and deck connection).
- D. The PVC waterstop shall be extruded from an elastomeric plastic material of which the basin resin is prime virgin polyvinyl chloride. The PVC compound shall not contain any scrapped or reclaimed material or pigment whatsoever.
- E. PVC waterstop shall not stain or discolor concrete or adjacent metal structures.
- E. Performance Requirements as follows:

Property	Test Method	Required Limits
Water absorption	ASTM D 570	0.15% max
Tear Resistance	ASTM D 624	300 lb/in (52.5 kN/m) min.
Ultimate Elongation	ASTM D 638	350% min.
Tensile Strength	ASTM D 638	2000 psi (13.78 Mpa) min.
Low Temperature Brittleness	ASTM D 746	No Failure @ -35o F (-37o C)
Stiffness in Flexure	ASTM D 747	700 psi (4.82 Mpa) min.
Specific Gravity	ASTM D 792	1.38 max.

Hardness, Shore A	ASTM D 2240	79 ± 3
Tensile Strength after accelerated extraction	CRD-C 572	1600 psi (9.54 Mpa) min.
Elongation after accelerated extraction	CRD-C 572	300% min.
Effect of Alkalis after 7 days: Weight Change Hardness Change	CRD-C 572	between -0.10% / +0.25% +/- 5 points

## 2.07 ACCESSORIES:

- A. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field.
- B. Provide hog rings or grommets spaced at 12-inches on center along length of waterstop.
- C. Provide Teflon coated, thermostatically controlled waterstop splicing irons for field butt splices.

### PART 3 - EXECUTION

#### 3.01 INSPECTION:

- A. Surfaces to receive waterstop and sealants shall be clean, dry and free of oil, dust and loose particles.
- B. Before starting work, inspect all surfaces to receive waterstop and sealant work and report in writing to the Engineer any surfaces that are not suitable for application of such materials.
- C. Unsuitable surfaces shall be corrected before work begins. Commencement of material application to any surface shall constitute acceptance of that surface as proper to receive the work. Subsequent defects in work shall be corrected under this Section without additional cost to the Owner.

#### 3.02 PREPARATION FOR SEALANTS AND WATERSTOP:

- A. Notify the proper trades of locations where adequate rabbets for sealant have not been provided; all such rabbets shall be prepared by cutting and cleaning out material to the minimum depth required and by grinding to the minimum width by the appropriate trade.
- B. Wire brush full depth of joints in concrete, masonry, mortar and plaster as required to obtain a firm, clean surface. Clean metal surfaces with wire brush where required to remove scale and other deposits and wipe clean with a mild, non-staining solvent. Clean other surfaces by methods approved by the sealant manufacturer. Where joint has been mortar-filled, rake out existing mortar 3<sup>3</sup>/<sub>4</sub>-inches deep.
  - 1. Prime surfaces to receive sealing compounds where recommended by manufacturer in accordance with manufacturer's printed instructions.
- C. Install continuous lengths of joint backing material in proper size, shape, and depth. Except where otherwise specified or recommended by manufacturer, depths of joints not exceeding 1/2-inch in width shall be approximately the same as the width.

Depth of joints exceeding ½-inch in width shall be approximately ½ the width of the joint. No sealed joint shall be less than ¼-inch deep.

- D. Install joint backup in all exterior joints in excess of 5/8-inch depth, and in all interior joints requiring backup, placing the bead in the joint in a manner that will assure constant sealant material depth. Set bead into joint continuously by slightly stretching during placement to permit compression against sides of joint without surface wrinkles or buckles.
- E. Waterproof membrane shall be installed on clean concrete surface and membrane drain shall be protected from being plugged or covered with material.

### 3.03 SEALANT APPLICATION:

- A. Apply sealant only to clean, dry surfaces, and only when the ambient temperature is within manufacturer's recommended range.
- B. Application shall be in strict accordance with manufacturer's printed instructions.
- C. Apply gun grade sealants with sealant guns of type approved by sealant manufacturer using nozzles sized to fit into joints and drive material with sufficient pressure to fill all voids. Install sealants in continuous, uninterrupted, full-length beads. Superficial pointing of joints with a thin bead of compound will not be acceptable.
- D. Apply pouring grade sealant at horizontal and deck joints in accordance with manufacturer's recommendations over joint backing. Joints shall be continuously filled, level and smooth.
- E. Neatly point and tool all finished joints, concave, uniformly smooth and free of wrinkles, waves, sag lines, and other imperfections. Keep outer edge of sealant 1/8-inch back from face of surrounding material. Remove masking tape immediately after tooling but before sealant has set.
- F. Provide sealant at exterior saddles and thresholds not sealed under another Section. Set same in a full bed of exterior sealant not less than 3/8-inch thick. Clean off excess compound after installing.
- G. Surfaces of all materials adjoining sealant joints shall be fully protected and be kept clean and free of smears of compound or other soiling due to sealant application. Use non-staining masking tape as required.

### 3.04 COMPRESSION SEAL INSTALLATION (WATERSTOP):

- A. Follow manufacturer's instructions for sizing and installing PVC. Use tools, adhesives and lubricants as recommended.
- B. Seal shall fill entire opening snugly to prevent water entry. Edges shall be straight and without ripples or wrinkles.
- C. All connections shall be welded together and tested to insure watertight seal.

### 3.05 INSTALLATION:

- A. Field butt splices shall be heat fused welded using a Teflon coated thermostatically controlled waterstop splicing iron at approximately 380 degrees F. Follow approved manufacturer recommendations. Lapping of waterstop, use of adhesives, or solvents shall not be allowed.
- B. Center waterstop in joint and secure waterstop in correct position using hog rings or grommets spaced at 12-inches on center along the length of the waterstop and wire tie to adjacent reinforcing steel.

### 3.06 FIELD QUALITY CONTROL:

- A. Waterstop splicing defects which are unacceptable include, but are not limited to the following:
  - 1. Tensile strength less than 80 percent of parent section.
  - 2. Misalignment of center bulb, ribs, and end bulbs greater than 1/16-inch.
  - 3. Bond failure at joint deeper than 1/16-inch or 15 percent of material thickness.
  - 4. Misalignment that reduces waterstop cross section more than 15 percent.
  - 5. Visible porosity in the weld.
  - 6. Bubbles or inadequate bonding.
  - 7. Visible signs of splice separation when cooled splice is bent by hand at a sharp angle.
  - 8. Charred or burnt material.

### 3.07 PROTECTION AND CLEANING:

- A. Clean all surfaces of adjacent surfaces, which have been marked or soiled by the work of this Section, removing all excess materials there from. Use only cleaning materials and solvents that will not damage the surfaces in any way.
- B. Remove all debris and rubbish as the work progresses, and legally dispose of same.
- C. At completion of work, do final cleaning, leaving the work and adjacent surfaces in a clean and neat condition.

END OF SECTION



## SECTION 09 22 00

### PLASTER

#### PART 1 – GENERAL

##### 1.01 WORK INCLUDED:

- A. Plaster upper basin, mid basin, and lower basin with approved design mix.
- B. Plaster shall be chosen and approved by the Historical Commission.
- C. Water analysis and pre-fill requirements.

##### 1.02 RELATED WORK:

- A. The following items of related work are specified and included in other Sections of the Specification:
  - 1. Section 01 33 20, SUBMITTALS
  - 2. Section 03 37 13, SHOTCRETE

##### 1.03 QUALITY ASSURANCE:

- A. Materials used in fulfilling the requirements of this Section shall be suitable for each intended use and shall be of the type specified for each category. Materials shall be applied under temperatures required for each type in accordance with the manufacturers' recommendations.
- B. In addition to other requirements, compounds shall contain no acid or ingredients that will affect masonry, corrode metal, or have injurious effects on paint.
- C. Use proper materials specified herein for each location whether Drawings call for "caulking" or "sealant".
- D. Submit manufacturers' certification of compliance with these specifications for each material. (Acceptable for use in swimming pool.)
- E. Protect all pipes, fittings, gutters and drains from debris during preparation and plaster operations.

##### 1.04 REFERENCES:

- A. The following standards form part of these specifications as referenced:

American Society for Testing and Materials (ASTM)

ASTM	C150	Portland Cement
ASTM	C144	Aggregate for Masonry Mortar
ASTM	C207	Hydrated Lime for Masonry Purposes
ASTM	C206-03	Finishing Hydrated Lime

1.05 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Samples: Prepare 24-inch by 24-inch square panel at the site showing color and texture for pool plaster. Finished plasterwork shall match the approved sample panel.
- B. Certificates: Submit certificates attesting that the materials furnished meet the requirements specified herein.
- C. Certifications: Please submit the resumes of the individuals performing the work and a list of previously completed projects in the last five years that uses the same material and technique as the material being submitted
- D. Test Report: Submit results of domestic water analysis and calculation of amounts of chemicals required to balance pool water on initial fill of pool.

1.06 PRODUCT DELIVERY AND STORAGE:

- A. Deliver manufactured materials to site in manufacturers' original unbroken packages or containers bearing manufacturers' name and brand labels. Keep cementitious materials dry until ready to be used and stored off the ground, under cover and away from damp surfaces.

1.07 JOB CONDITIONS:

- A. Apply plaster in swimming pool only when ambient temperature is above 40 degrees F and below 90 degrees F, and protect applied plaster from rapid drying by sun or wind until curing is completed or pool is filled with water. Proper application temperatures shall confirm with the submitted products manufacturers specifications.

1.08 GUARANTEES:

- A. The Contractor warrants to the Owner that materials and equipment furnished under the contract will be of good quality and new unless otherwise required or

permitted by the Contract documents, that the work will be free from defects not inherent in the quality required or permitted and that the work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, improper or insufficient maintenance, improper operation, modifications not executed by the Contractor or improper wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a period of one year, unless otherwise specified.

- B. The Contractor shall agree to repair or replace any work at no cost to the Owner, upon written notification from the Owner within the warranty period. Prorated warranties are not acceptable.

#### 1.09 MOCK UP:

- A. Contractor shall provide a 2 FT by 2 FT mock up three possibly material finishes, determined by the Historical Commission. This shall be performed prior to the installation of the plaster prior to the installation. Material shall be chosen and approved by the Historical Commission. Four mockups shall be supplied with the different types of plaster presented or different types of blended plaster provided.

### PART 2 – PRODUCTS

#### 2.01 APPROVED SUPPLIES AND COLOR STYLES:

- A. Plaster finish found in the lower basin shall be plaster by Pebble Tech. Color shall be a type of plaster from their "Pebble Tech" line, or an approved equal. Plaster type shall ultimately be any type of exposed aggregate plaster finish with rounded stone material similar to tones found in the sample concrete slab. The plaster mixture shall be able to be blended in order to achieve the aggregate finish and color desired. This style shall be applied on all walls and floor of the basin. Contractor shall provide a 2 FT by 2 FT mock-up of the selected plaster finish for Historical Commissions approval.
- B. Plaster finish found in the upper and mid basin shall be plaster by Pebble Tech. Color shall be "Black Galaxy", or approved equal. The finish shall be a smooth black finish. This style shall be applied on only the floor of the basins. Contractor shall provide a 2 FT by 2 FT mock-up of the selected plaster finish for Historical Commissions approval.
- C. Or Approved Equal.
- D. Water: Clean, fresh, from domestic potable source.

- E. Contractor to submit color sampling with colors that are similar to the ones listed above if an alternative sample is to be selected.

## 2.03 PROPORTIONS AND MIXING:

- A. Materials are specified on a volume basis and shall be measured in approved containers, which will insure that the specified proportions will be controlled and accurately maintained during the progress of the work. Measuring materials with shovels ("shovel count") is not permitted.
- B. White Marble Pool Plaster Finish Coat: Mix finish in proportion of one part by volume of white Portland Cement to not more than two parts by volume of aggregates (specified white marble dust).
- C. Special plaster additives must be pre-approved by Engineer prior to use.
- D. Mixing: Perform mixing in approved mechanical mixers of the type in which quantity of water can be controlled accurately and uniformly. While mixer is in continuous operation, charge approximately 90% of estimated quantity of water, half of sand, all cement, and the other one-half of the sand into mixer in that sequence and mix thoroughly with remainder of water until mixture is uniform in color and consistency. Avoid excess mixing to prevent hasty solution of cement resulting in accelerated set. Discard plaster, which has begun to set before it is used, retempering is not allowed. Do not use any caked or lump materials. Completely empty mixer and mixing boxes after each batch is mixed and keep free of old plaster.

## PART 3 – EXECUTION

### 3.01 PREPARATION OF SURFACES:

- A. Clean base surfaces of projections, dust, loose particles, grease, bond breakers, and foreign matter; make sufficiently rough to provide a strong mechanical bond. Wash entire concrete pool shell with acidic solution within two (2) hours of plastering. Do not apply plaster directly to the surfaces of masonry or concrete that are coated with any acidic solution compound or similar agent until compound or agent is completely removed by water blasting. Thoroughly wash entire surface with 2,000-psi high-pressure water immediately prior to plastering. Wet cementitious base surfaces with a fine fog water spray to produce a uniformly moist condition and check screeds, pool equipment, and accessories for correct alignment before plastering is started. Do not apply plaster to base surfaces containing frost. Install temporary coverings as required to protect adjoining surfaces from staining or damage by plastering operations.
- B. Bond coats or scratch coats used must be pre-approved by Engineer prior to application on pool surface.

### 3.02 APPLICATION OF PLASTER:

- A. General: Apply finish plaster to minimum ½-inch thickness at any location. Apply finish plaster by hand or machine. If plastering machine is used, control fluidity of plaster to have a slump not exceeding 1-1/2-inches when tested using a 2-inch by 4-inch by 6-inch high slump cone. Do not add additional water to the mix subsequent to determining water content to meet this slump. Perform slump test according to following procedure:
1. Place cone on level, dry non-absorptive base plate.
  2. While holding cone firmly against base plate, fill cone with plaster taken directly from hose or nozzle of plastering machine, tamping with a metal rod during filling to release all air bubbles.
  3. Screed off plaster level with top of cone. Remove cone by lifting it straight up with a slow and smooth motion.
  4. Place cone in a vertical position adjacent to freed plaster sample using care not to jiggle base plate.
  5. Lay straightedge across top of cone being careful not to vibrate cone, measure slump in inches from bottom edge of straightedge to the top of slumped plaster sample.
- B. Workmanship: Apply finish plaster in two coats by “double-back” method with second coat applied as soon as first coat is tamped and initially floated. Apply plaster with sufficient pressure to provide a good bond on bases. Work plaster to screeds at intervals of from 5 feet to 8 feet on straight surfaces. Apply smooth trowel finish without waves, cracks, trowel marks, ridges, pits, crazing, discoloration, projections, or other imperfections. Form plaster carefully around curves and angles, and consequent drooping of applications. Produce surfaces free of visible junction marks in finish coat where one day’s work adjoins another.
- C. Curing: Cure plaster with fine fog water spray applied to finish coat as frequently as required to prevent dry-out of plaster. Keep plaster damp until pool is filled. Prevent damage or staining of plaster by troweling.
- D. Patching, Pointing, and Cleaning Up: Upon completion, cut out and patch loose, cracked, damaged, or defective plaster; patches matching existing plaster in texture, color, and finish, flush with adjoining plaster. Perform pointing and patching of surfaces and plasterwork abutting or adjoining any other finish work in a neat and workmanlike manner. If 10 percent or more of the pool’s plaster finish is found to be defective, the plaster shall be removed from all surfaces and replaced completely. Remove plaster droppings or splatterings from all surfaces. Leave plaster surfaces in clean, unblemished condition ready for pool filling. Remove

protective coverings from adjoining surfaces. Remove rubbish and debris from the site.

### 3.03 PRE-FILL SPECIFICATION:

- A. Contractor shall employ a qualified water testing agency to analyze the domestic water with which the pool will be filled within 2 weeks of the plaster date, and shall employ a swimming pool experienced water chemistry consultant to determine types and quantities of chemicals required to ensure calcium-balanced water immediately upon the completion of water filling.
  - 1. Have on hand quantities of the chemicals as determined above, plus 25% overage for follow-up treatment. These chemicals, typically including calcium chloride, bicarbonate of soda, and muriatic acid, are in addition to standard chlorine products and alkalizer/ph control products required elsewhere.
- B. The surge tanks shall not be plastered until all other work in the area is substantially complete and the filtration system and chlorination systems are complete and ready for start-up. The Contractor shall supply all chemical required for treatment of the pool water.
- C. Contractor shall submit domestic water analysis to Owner and/or Engineer at least 2 weeks prior to filling the pool(s).

END OF SECTION

## SECTION 13 00 00

### SUMMARY OF WORK FOR WATER FEATURES

#### PART 1 – GENERAL

##### 1.1 WORK INCLUDED:

- A. Provide and include all shop drawings for the design of water feature structures and mechanical systems for submittal.
- B. Lay out water features; benchmark and exact location by General Contractor.
- C. Construct reinforced shotcrete concrete shell, including forming, and reinforcing steel.
- D. Trenching and backfill as required for water feature piping.
- E. Furnish and install prefabricated main drains, inlets, and recirculation systems. (Specified in Section 22 51 00).
- F. Furnish and install water feature filtration and chemical treatment equipment, including water feature fittings, piping, and valves as required for fully operable systems. (Specified in Section 22 51 00)
- G. Furnish and install pumps, piping, and valves as required for operation of circulation system. (Specified in Section 22 51 00)
- K. Provide all necessary sleeves, openings, or other penetrations in equipment room walls, pump pits, etc.; and closure of same required for water feature construction work.
- L. Furnish start up chemicals, test and balance the Fountain in accordance to State and Local standards prior to acceptance by the OWNER.
- M. Water feature Contractor shall protect the spray feature(s), associated filtration, chemical treatment, and electrical equipment during construction.

##### 1.2 RELATED WORK:

- A. The following Sections contain work that relates to this Section.

- 1. Section 22 51 00 – FOUNTAIN EQUIPMENT

##### 1.3 WORK PERFORMED UNDER OTHER SECTIONS (Not By Water Feature Contractor-WFC.):

- A. Site access for heavy equipment.
- B. Benchmark and exact water feature location.

- C. All machine excavation and backfill for water feature structure, main drain piping, pipe trenches, and balance, surge, or settling tanks - as shown on the Plans. Disposal of excavated material. General Contractor to furnish any required backfill material.
  - D. All base and sub-base material for water feature; compaction; and all compaction testing and soil testing.
  - E. Demolition of water feature area, grading, and any other area preparation required prior to the start of water feature construction.
  - F. Construction and backfill of all foundations, equipment room walls, footings, and sumps as required for water feature construction work.
  - G. Deck construction, finishes, expansion joints, caulking, drains, etc.
  - H. All caulking adjacent to the recirculation systems.
  - I. General construction work not included in water feature Specifications in this section.
  - J. The Plumbing Contractor shall provide fresh water piping in to filter vault, including back flow prevention device, shut-off valve, and hose bib; floor drains and deck drains; makeup water line to fill spout or balance tank; and waste water connection from filter. Install solenoid valve(s), water connection to cylinder-operated valves.
  - K. Provide access to filter room for filter access.
  - L. All electrical connections shall be by the Electrical Contractor; the WFC shall provide the filter, pumps, motors, solenoids, relays, water level probes (with housing), motorized valves, etc., as shown on Plans. All controls – including starters, shall be provided and installed by Electrical Contractor; the Electrical Contractor shall install and wire all electrical equipment furnished by the WFC and shall provide all disconnect switches as indicated or required by code. Chemical feeders shall be electrically interlocked with filter pump.
  - M. The Electrical Contractor shall ground the entire water feature structure, deck, and equipment in accordance with the National Electrical Code and all local Codes and Ordinances.
  - N. Provide all construction utilities, water, electric heat, or cold weather protection.
- 1.4 QUALITY ASSURANCE:
- A. Design Standards:
    - 1. Within the limits of constraints imposed by existing conditions, it is intended that the work of this contract shall comply with the following requirements:
      - a. American National Spa and Pool Institute Standard for Public Swimming Pools ANSI/NSPI-1 (2003).
      - b. State of Massachusetts Health Code 105 CMR 435.00 minimum standards for swimming pools.



- c. National Electrical Code, Article 680
- d. National Sanitation Foundation Standards for Swimming Pool Equipment. (N.S.F.)
- e. Massachusetts Building Code (780 CMR)
- f. Virginia Graeme Baker Pool and Spa Safety Act VGB 2008
- g. NSF/ANSI Standard 50 – Equipment for Swimming Pools, Spas, Hot Tubs and Recreational Water Facilities.
- h. United States Department of Justice – Americans with Disabilities Act (ADA)
- i. Standards for main drains, ASME A112.19.8-2007/8A-2008.

- B. Experience Qualifications: Work shall be performed by or under direct supervision of Water Feature Contractor with 5 years' experience in construction and equipping of water features of similar type. Submit list of 5 public projects, completed at least five years, for which water feature contractor was responsible for constructing a similar feature for public use.

#### 1.5 SUBMITTALS:

- A. Shop Drawings: Submit coordinated water feature structural steel shop drawings, showing types of anchors and method of anchoring fixed equipment. Provide rough-in information interfacing mechanical and electrical work and accurately dimensioned locations for sleeves, inserts, and anchors to be cast into concrete and installed into the building structure. Contractor shall submit on all materials to be supplied in the construction of this project, certifications, and resumes as stated in each section. Unless otherwise mentioned, the Contractor shall submit (6) copies of shop drawing submittals to the Engineer for review.
- B. Certification: Submit complete equipment list and duplicate copies of certificate from equipment manufacturer, properly attested, with statement that materials meet requirements of Contract Documents. Submit certificate for approval before doing any work.
- C. Product Data: Submit six (6) sets of manufacturer's data for operating equipment, valves, piping, drains, and equipment. Include roughing-in information for mechanical and electrical work. Product data shall be job specific. Generic submittals will be rejected.
- D. Maintenance Data: Shall be submitted in accordance with specification section 01 33 23.13.
- E. Contract Documents: Drawings are diagrammatic in part and are meant to indicate general arrangement of systems and equipment. Information shown on plans but not on Sections or schedules and vice-versa, shall be provided as if expressly required on both. It is not intended that Contract Documents indicate every fitting offset, line or component necessary for particular supplier's system; but it is intended that systems and equipment supplied shall be complete and operational, whether or not shown or specified. Specified items may in fact be disapproved during Submittal Review if they do not form part of a complete system. Contractor shall submit to the Engineer their proposed piping and equipment layout for the Menotomy Fountain.

- F. Health Department: Contractor shall be responsible for submittal and cost of submissions to regulatory agencies including: Massachusetts Department of Public Health and any other agencies having jurisdiction.
- G. Permits: Contractor shall be responsible for obtaining and paying for all permits, inspections, licenses and certificates required for work under this Section.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver material in manufacturer's original, unopened containers and crates with all labels intact and legible.
- B. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.
- C. Handle materials in a manner to prevent damage.
- D. Store all materials on clean raised platforms with weather protective covering when stored outdoors. Provide continuous protection of materials against damage and deterioration.
- E. Remove damaged materials from site.

1.7 GUARANTEES:

- A. Provide standard written manufacturers' guarantees in the Owner's name for materials furnished under this Section where such guarantees are offered in the manufacturers' published product data.
- B. Furnish written warranty for materials and workmanship of systems installed under this Section against defect in materials and workmanship for 1 year.
- C. The Contractor warrants to the Owner that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, improper or insufficient maintenance, improper operation or insufficient maintenance, improper operation, modification not executed by the Contractor or the Owner; the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. All warranties shall be for a period of one year from the date of Substantial Completion unless otherwise specified.
- D. The Contractor shall agree to repair or replace any Work at no cost to the Owner, upon written notification from the Owner within the warranty period. Prorated warranties are not acceptable.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS:

- A. Products of particular manufacturers have been specified to establish a standard of quality and performance.
- B. Proposals, including list of manufacturers and itemized products for other systems, will be reviewed by Engineer to determine their comparability to scope and quality required by Contract Documents.
- C. All equipment furnished hereunder shall be by manufacturers with at least 5 years' experience in the fabrication and installation of the item specified with at least 10 installations on public water features similar in scope to this project.

## PART 3 – EXECUTION

### 3.1 TESTING AND INSPECTION:

- A. Water Feature Piping: Test water feature piping to 35-psi hydrostatic pressure for a minimum of 2 hours before placement of covering concrete slabs. Pressure shall remain on piping until the commissioning of the filtration equipment.
- B. Water for testing will be provided by Owner.
- C. Test should be done after installation of feature.
- D. Contractor shall coordinate inspector services for all concrete and steel reinforcing.
- E. Additional testing requirements are required per the individual Specification Section for the Menotomy Fountain.
- F. Contractor shall provide (1) day training session for the constructed system to the Town and Historical Commission. The Contractor shall video tape this training session, and turned over to the Town via DVD or a Thumb drive for future use.

END OF SECTION

## SECTION 22 00 00

### PLUMBING

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. This section of the specification covers the complete interior plumbing work, including but not limited to the following:

- Pipe and fittings
  - Valves
  - Hangers and supports
  - Backflow preventers

##### 1.02 RELATED WORK:

- A. Section 13 00 00, SUMMARY OF WORK FOR WATER FEATURE
- B. Division 26, ELECTRICAL

##### 1.03 SYSTEM DESCRIPTION:

- A. The Contractor shall furnish and install new domestic plumbing piping, hangers, valves, and backflow preventer, inside the existing vault as herein specified on the contract plans. Piping, valves, and backflow preventer pipe diameter shall be  $\frac{3}{4}$ ".

##### 1.04 QUALITY ASSURANCE:

- A. The Contractor, at his own expense, shall do all work required by and in accordance with applicable State and local plumbing codes; shall arrange for all permits, inspections, and tests required by those codes; and shall do everything necessary to provide complete systems which will be ready for use without further expense to the Owner.
- B. Work and materials shall conform to applicable codes, utility company standards, and the rules and regulations of authorities having jurisdiction.
- C. Should work or material called for in the specification or on the drawings not conform to the requirements of the previous paragraphs, above, the Contractor shall so notify the Engineer when submitting his proposal. Failing to do this, the Contractor shall comply with these requirements at his own expense.

##### 1.05 REFERENCES:

- A. The following standards form a part of this specification:

American Society for Testing and Materials (ASTM)

ASTM	A53	Specification for Welded and Seamless Steel Pipe
ASTM	A120	Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinance Uses
ASTM	A72	Specification for Welded Wrought Iron Pipe
ASTM	A74	Specification for Hub and Spigot Cast Iron Soil Pipe and Fittings
ASTM	A167	Specification for Stainless and Heat-Resisting Chromium - Nickel Steel Plate, Sheet and Strip
ASTM	B62	Specification for Composition Bronze Ounce Metal Castings
ASTM	B88	Specification for Seamless Copper Water Tube
ASTM	C564	Standard Specifications for Rubber Gaskets for Cast Iron soil Pipe and Fittings
ASTM	D3034	Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings.
ASTM	D3212	Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

American National Standards Institute (ANSI)

ANSI	B16.3	Malleable-Iron Screwed Fittings 150 and 300 lb.
ANSI	B16.12	Cast Iron Screwed Drainage Fittings
ANSI	B16.26	Cast Bronze Fittings for Flared Copper Tubes
ANSI	B16.18	Cast Bronze Solder-Joint Pressure Fittings
ANSI	B16.22	Wrought Copper and Bronze Solder-Joint Pressure Fittings

American Water Works Associations (AWWA)

AWWA	C651	Standard for Disinfecting Water Mains
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1.06 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

- A. Shop drawings shall consist of manufacturer's scale drawings, cuts, or catalogs, including descriptive literature and complete characteristics, code requirements, and motor drive. Shop drawings shall be identified by name and number of equipment, as indicated on contract drawings or in the specification. Catalog data submitted without proper identification of model number or type will not be accepted or acted upon by the Engineer. Information on shop drawings which applies to models or systems which are not to be provided hereunder and which does not specifically apply to the item submitted shall be

deleted.

- B. Shop drawings of the following equipment and materials shall be submitted for review:

Valves (all types)  
Hangers and supports  
Backflow Preventers

1.07 SEQUENCING/SCHEDULING:

- A. Contractor shall cooperate with Contractors for other work to avoid interference of plumbing work with that of other trades.
- B. Pertinent contract and shop drawings of other trades shall be consulted as required for proper coordination of work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. PIPE AND FITTINGS:

1. All pipe and fittings shall conform to the listed ASTM and ANSI Specifications as applicable, unless otherwise indicated.
2. All water piping in buildings shall be Type L, drawn, copper water tubing. Underground water piping shall be Type K, annealed, copper water tubing with flared joints.

B. VALVES:

1. Except where flanged valves are specified or required to suit flanged connections, the valves described below shall have screwed ends where used with pipe. Where used with copper tubing, they shall have solder-joint ends or, at the Contractor's option, may have screwed ends for which solder joint adapters for copper tubing shall be provided. In addition to the requirements hereinafter specified, all valves shall be equal in quality and performance to those made by Crane Co., New York, N.Y., Jenkins Bros., New York, N.Y., Kennedy Valve Mfg. Co., Elmira, N.Y.; Lukenheimer Co., Cincinnati, Ohio; William Powell Co., Cincinnati, Ohio; or Walworth Co., New York, N.Y. Insofar as possible, all valves shall be the product of one manufacturer.
2. Gate valves 2-1/2-inches and smaller shall be 150 lb. bronze valves with screwed or solder-joint ends, as hereinbefore specified, and body material shall conform to Standard Specification for Composition Bronze or Ounce Metal Castings, ASTM B62. Valves shall have union bonnet, rising stem, inside screw, and solid wedge gate. Stems shall be made of wrought silicon bronze. If the manufacturer does not furnish this stem material in the class specified, the valves shall be furnished in the next higher class in which the stem material is available.

3. Globe, angle and check valves 2-1/2-inches and smaller shall be 150 lb. bronze valves with screwed or solder-joints ends as hereinbefore specified, and body material shall conform to Standard Specification for Composition Bronze or Ounce Metal Castings, ASTM B62. Valves shall have union bonnet, plug disk globe, renewable or regrindable seat, swing check. Stems shall be made of wrought silicon bronze. If the manufacturer does not furnish this stem material in the class specified, the valves shall be furnished in the next higher class in which the stem material is available.
4. Globe or angle valves may be used for stop valves one inch and smaller, subject to the approval of the Engineer.
5. Strainers shall be placed ahead of each control valve and elsewhere as specified or indicated on the drawings. Strainers shall be screwed or flanged as specified for valves. Bodies shall be of the T, S, or Y type designed for not less than 125 lb. working pressure. Screens shall be bronze, Monel or stainless steel. The size of the perforation shall be 1/32-inch for strainers 3/4-inch to 2-inches, inclusive, and 1/16-inch for strainers over 2-1/2-inches in size.
6. The free area of each screen shall be not less than three times the area of the strainer inlet pipe. Unless the strainer design is devoid of air pockets, a 1/4-inch air vent cock shall be provided.
7. Manufacturers of other products comparable in quality and type to those specified will be acceptable, if, said products are offered by the Contractor with satisfactory data on past performance and other information required, and if approved by the Engineer.
8. Pressure-reducing valves 4-inches and smaller shall be self-contained, bronze body, single-port valves with spring-loaded diaphragm. The valve shall be equal to the pressure-reducing valves manufactured by Fisher Governor Co., Marshalltown, Iowa; Worthington Controls Co., Div., Norwood, Mass.; or Watts Regulator Co., Lawrence, Mass.

C. BACKFLOW PREVENTERS:

1. Backflow preventers shall be Watts No. 909S reduced pressure principle backflow preventer or approved equal and shall be listed by **the Massachusetts Department of Environmental Protection** as approved backflow prevention devices. Each unit shall be a complete assembly including shut-off valves before and after the device and shall include a strainer, test cocks and pressure differential relief valve. Furnish test kit No. TK-9A and spare parts for each backflow preventer. This Contractor shall obtain and pay for the required permits.

D. MISCELLANEOUS FITTINGS:

1. Items listed in this subsection shall be equal to Josam, Zurn or Beacon. Manufacturers of other products comparable in quality and type to those specified will be acceptable if, said products are offered by the Contractor with satisfactory data on past performance and other information required, and if approved by the

Engineer.

2. Shock absorbers shall have stainless steel castings and air charged bellows; 1-inch NPT male end connections; Zurn Shoktrols Model 300.
3. Wall cleanouts for drainage lines shall be cast iron countersunk plugs with cast iron ferrule; polished nickel-bronze round access cover with securing screw; Josam Y-130-BB. Threaded plug size shall suit arrangement drawings, access cover shall be 7-3/4-inch diameter for all sizes of plugs.
4. Floor cleanouts for drainage lines shall be cast iron with seriated cut-off sections, bronze internal plug same size as ferrule, and heavy-duty cover with the letters "C.O." cast in, vandal proof screws: Josam 8000.
5. Relief valves shall be combination temperature and pressure relief valves; capacity to suit heating element size; Watts 40L.
6. Gages shall be furnished and installed with the specified equipment as indicated on the drawings or specified, and shall be complete with all shutoff cocks and extensions necessary to clear insulation and maintain visibility.
7. Gages shall have a black case and shall be 4-1/2-inches nominal diameter with phosphor bronze Bourdon tubes (beryllium copper bellows), 1/4-inch NPT male connection, stainless steel rack and pinion movement, microadjustment for calibration, white dials and black figures, threaded ring case. Gages shall have a guaranteed accuracy of at least one percent of scale range.
8. T-branch cleanouts shall be cast iron, sized to fit the line in which they are installed, with line size rough brass raised head plug with polished brass round access cover. Countersunk screw between cover and raised plugs shall be of length to suit final installation; Josam Y-1510.
9. Wall hydrant shall be cast brass non freezing with 3/4-inch NPT outlet, T handle polished face bronze wall casing, renewable nylon seat, brass operating parts and 3/4-inch male NPT inlet connection with integral vacuum breaker, Smith Series 5509.
10. Ground cleanouts shall be cast iron with seriated cut-off sections, with all brass adjustable head, heavy-duty cover with letters "C.O" cast in, and screwed cleanout

E. WATER METER:

Water meter shall be of type approved by the water system owner providing service to this project and furnished and installed in accordance with water system owner requirements.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. PIPE AND FITTINGS:



1. All piping shall be installed in a neat, workmanlike manner, and the various lines shall be parallel to building walls wherever possible. Piping shall be installed to accurate lines and grades, and shall be supported by hangers of the type and spacing hereinafter specified. Where temporary supports are used, they shall be sufficiently rigid to prevent shifting or distortion of the pipe. Suitable provision shall be made for expansion where necessary.
2. All piping shall pitch toward low points, and provision shall be made for draining these low points. Sanitary and roof drainage piping shall be pitched 1/4-inch per foot wherever possible, but under no circumstances less than 1/8-inch per foot. Piping shall be installed to allow for easy winterization.
3. Before assembly, all dirt and chips shall be removed from inside the pipe and fittings and from the threads.
4. After being cut to final lengths, the ends of steel pipe and copper tubing shall be reamed to remove burrs.
5. Threads of all screwed joints shall be clean-cut and of long taper. Screwed joints shall be made up with an approved pipe joint compound applied to the male threads only.
6. All pipe connected to recessed drainage fitting shall be screwed against the shoulder of the fittings.
7. Pipe-joint compound, for pipe carrying flammable or toxic gas, must bear the approval of the Underwriter's Laboratories or Factory Mutual Engineering Division.
8. Isolation valves shall be provided in all branches, subbranches, and equipment connections, whether or not indicated on the drawings.
9. Joints, which are required to be backed off, shall be entirely disjointed, the threads of both the pipe and fittings wiped clean, new joint compound applied and the connection reassembled.
10. No close nipples will be allowed.
11. Solder joints for copper tubing shall be prepared by cleaning the ends of the tubing and the inner surfaces of the fittings with steel wool until they are bright. The cleaned surface shall be given a thin coating of approved non-lead soldering flux, and the tubing end inserted into the fittings as far as possible. Heating and finishing of the joint shall be done in accordance with the recommendations of the manufacturer of the fittings, using solid string or wire solder with no more than 0.2 percent lead. Solder shall be 95 percent tin and 5 percent antimony, or other approved composition. The use of cored solder will not be permitted.
12. Flared joints for copper tubing shall be cut and burred (as above) after which the sleeve nut shall be slipped on the tubing and the end flared with a flaring tool. Care shall be taken in flaring not to crack or split the flared portion, but if inspection reveals such damage, the flare shall be cut off and a new flare made. The flared end

shall be squarely seated on the fitting and the nut tightened.

13. A sufficient number of unions shall be used to allow for the dismantling of all water pipe, valves, and equipment. Unions shall be 250 WSP and shall be made of brass or bronze for joining nonferrous pipe and malleable iron or steel with brass or bronze seats for joining ferrous pipe. In vent piping, Tucker connections shall be used instead of unions.
14. Joints in soil pipe shall be made with picked oakum, packed tightly into the space between the hub and the pipe, and molten lead at least one inch in depth. Each joint shall be made in one pouring and caulked to ensure tightness.
15. Joints between soil pipe and steel pipe shall be made with malleable-iron Manhoff fittings.
16. The type of service of piping, whether exposed or concealed in pipe chases or above ceilings, shall be properly identified by means of labels. Labels shall be adhered to piping at not more than 25 feet o.c. Labeling on branch lines shall begin at take-off from main line. Piping systems to be identified include the following:

Hot water,  
Sanitary vent, Cold water  
Sanitary drains  
Domestic water, Protected water\*

\*All high pressure and low pressure lines downstream of the backflow preventer are classified as "protected water" lines.

#### B. VALVES:

1. At the completion of the installation, the Contractor shall tag all valves with 1-1/2-inches square brass or aluminum numbered tags. Tags shall be attached to valve bonnets with metal hooks as manufactured by National Tags and Label Company, or approved equal.

#### C. HANGERS AND SUPPORTS:

1. All piping and equipment shall be supported rigidly from the building structure by approved hangers and supports. Piping shall be supported to maintain the necessary pitch, to prevent vibration, and to provide for expansion and contraction.
2. Hangers shall be secured to beams or approved malleable-iron inserts wherever practicable. The Contractor shall furnish and set all inserts before the concrete is placed.
3. Hangers shall be adjustable wrought-band, or wrought-clevis hangers with iron rods.
4. Hangers in contact with copper tubing shall be copper plated.
5. Hangers in contact with galvanized pipe shall be galvanized.

6. Vertical pipes shall be supported at each floor level by means of steel friction clamps. Long vertical drops shall be suitably braced at the top to prevent vibration.
7. Hangers shall be installed at locations not more than 8 feet from ends of each runout, nor more than one foot from each change in direction. The maximum spacing of hangers for the various sizes and types of pipe shall be as follows:

Up to 1 in.	7 ft.
1-1/2 in. to 2 in.	9 ft.
2-1/2 in. to 3 in.	11 ft.
4 in. and larger	14 ft.
Cast iron soil pipe, all sizes	5 ft.

### 3.02 QUALITY ASSURANCE:

- A. Upon completion of installation, all pipelines shall be tested by the Contractor in the presence of the Engineer or the plumbing or building inspector, and in accordance with the requirements of local or applicable plumbing or building code.
- B. Piping located underground shall be tested before being backfilled. Piping to be insulated or painted shall be tested before the insulation or paint is applied. Portions of piping that will be concealed before completion shall be tested separately in the same manner as described below for the entire pipeline.
- C. All materials, equipment, tools and labor for testing shall be furnished by the Contractor.
- D. Piping which carries water or liquid under pressure shall be filled with water and subjected to a pressure of 125 psig. or 1-1/2 times the normal working pressure, whichever is greater, for a period of two hours or longer as may be necessary to examine the piping for leaks.
- E. Soil, vent, waste, and roof or other drain piping shall be tested by filling with water to the top of the highest vent stack above the roof, with all outlets plugged. The piping shall hold this water for a period of 30 minutes without showing a drop greater than 4-inches in the water level.
- F. Should leaks be found, faulty joints shall be repaired, even to the extent of disassembling and remaking the joint. Caulking of threads or the use of chemical compounds to correct leaks will not be permitted. The Contractor shall replace defective pipe or fittings, and the tests shall be repeated until test requirements are met to the satisfaction of the Engineer.

### 3.03 ADJUSTING AND CLEANING:

- A. Apparatus shall be thoroughly lubricated and cleaned before being placed in final operation. Finished surfaces shall be restored if damaged, and the entire installation shall be delivered in an approved condition.
- B. Items with porcelain-enameled surfaces, and others for which no satisfactory field repair is possible, shall be replaced if damaged before final acceptance of the installation.
- C. Labels shall be removed. Plumbing fixtures shall be washed clean. Floor drains and

receptors shall be clean, free of debris, and shall be sealed with water. Liquid piping systems shall be thoroughly flushed.

3.04 DISINFECTION:

- A. The Contractor shall disinfect water piping before it is placed in service.
- B. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in the Standard for Disinfecting Water Mains, AWWA C651.
- C. The dosage shall be such as to produce a chlorine residual of not less than 10 ppm after a contact period of not less than 24 hours. After treatment, the piping shall be flushed with clean water until the residual chlorine content does not exceed 0.2 ppm.
- D. During the disinfection period, care shall be exercised to prevent contamination of water in the street main.

3.05 RECORD DRAWINGS:

- A. As the work progresses, legibly record (red line) all field changes on a set of project contract drawings. Prior to Substantial Completion of the project, submit the red lined prints to the Engineer for use in preparation of the record drawings.

3.06 OPERATION & MAINTENANCE MANUAL:

- A. Upon completion of all work, and before final inspection and acceptance of the installation by the Engineer, four (4) copies of a complete instruction manual, bound in booklet form and suitably indexed, shall be submitted to the Engineer for approval. The manual shall be fully typewritten or printed; material written in longhand shall not appear in the manual. The manual shall contain the following:
  - 1. Brief description of each system covering basic operating characteristics.
  - 2. List of all equipment, with manufacturer's name and model number of each item.
  - 3. Manufacturer's literature describing each item of equipment.
  - 4. Parts list for each major item of equipment.
  - 5. Detailed step-by-step instructions for starting and shutdown of system.
  - 6. Detailed maintenance instructions for systems.

END OF SECTION

## SECTION 22 51 00

### FOUNTAIN EQUIPMENT

#### PART 1 - GENERAL

##### 1.1 WORK INCLUDED

- A. Furnish and install complete fountain mechanical system as indicated on the drawings and as specified herein, including:
  - 1. The complete fountain water filtration systems shall include the media, filter tank, internal collection and distribution system, vent, valves, pumps and motors, control equipment, and instrumentation.
  - 2. Furnish and install auto-fill systems.
  - 3. Furnish and install pipe, fittings and valves as required.
  - 4. Furnish and install pipe fittings and valves as required to plumb fountain fittings, drains, inlets, fill and drain systems, filter and backwash.
  - 5. Provide custom fountain fittings and grating for water distribution.
  - 6. Furnish and install Schedule 80 PVC pipe and fittings for all pipe runs between filter room and spray features. Filter room pipe and fitting to be schedule 80 PVC.
  - 7. Furnish and install all chemicals, storage tanks and chemical analyzers.
- B. Final testing and demonstration to Owner.
- C. Provide system start up and operator training by a certified manufacturer's representative. Operator training shall occur until the owner is satisfied with the training.

##### 1.2 RELATED WORK

- A. The following divisions contain work that relates to this section:
  - 1. Section 13 00 00, SUMMARY OF WORK FOR WATER FEATURES
  - 2. Division 26 – ELECTRICAL

##### 1.3 QUALITY ASSURANCE

- A. Special attention is directed to the materials, design standards and performance characteristics described in the bidding documents and shown on the Drawings. They establish standards of function, dimension, appearance, durability, design, operational efficiency and performance, and overall quality required of the filter systems. In order to assure that each item of equipment performs in conjunction with all other system components, the Owner requires that the filter manufacturer be a single source of supply for all the items of equipment as listed and described

within the complete Section 13 00 00. The Owner and Engineer may reject any system not meeting any or all of the specific performance requirements herein.

- B. Only suppliers/manufacturers who have established a proven record of performance with at least five (5) years of cartridge filter fabrication shall be acceptable. System shall be fabricated and fully assembled in a Certified Manufacturing Plant. Filters must have proven filtration performance demonstrated by at least ten (10) swimming fountains or fountains operating at least one year under normal loading conditions, which have consistently operated at least 25 days between media replacement or cartridge cleaning. Prime bidders are cautioned that the manufacturers' stock pressure sand filtration systems will be approved only if such system, in fact, meets all the material and performance requirements specified herein.
- C. The filter system shall meet all State and local Health code requirements.
- D. Due to the specialized nature of the work and products herein, the installation Supervisor of the Manufacturer shall be required to have a minimum of three (3) years of filtration installation experience and show at least five (5) installations of similar fountain filtration systems in successful operation for at least two (2) years.

#### 1.4 REFERENCES

- A. American National Standards Institute/National Spa and Pool Institute (ANSI/NSPI) ANSI/NSPI 1 - American National Standard for Public Swimming Pools.
- B. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) A112.19.8 - Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs, Includes Addenda A.
- C. ASTM International (ASTM):
  - 1. D1784 - Standard Specification for Rigid Polyvinyl chloride (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
  - 2. D1785 - Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120.
  - 3. D2564 - Standard Specification for Solvent Cements for Polyvinyl chloride (PVC) Plastic Piping Systems.
  - 4. D2855 - Standard Practice for Making Solvent-Cemented Joints with Polyvinyl chloride (PVC) Pipe and Fittings.
- D. International Association of Plumbing and Mechanical Officials (IAPMO).
- E. National Fire Protection Association (NFPA) 70 - National Electric Code.
- F. National Sanitary Foundation/American National Standards Institute (NSF/ANSI) Standard 50 - Circulation System Components and Related Materials for Swimming Pools, Spas/Hot Tubs.
- G. Virginia Graeme Baker Pool and Spa Safety Act VGB 2008.

1.5 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING

A. Submittals for Review:

1. Product Data: Manufacturer's descriptive data, specifications and installation instructions for:
  - a. Piping.
  - b. Filters.
  - c. Pumps and strainers.
  - d. Ozone treatment
  - e. Variable Frequency Drives (VFD).
  - f. Valves, restraints.
  - g. Gauges, control panels, controls, and flow meters.
  - h. Electrical Control Motor Center.
2. Contractor to supply six (6) original hardcopies, or electronic copies upon request to the Engineer for review prior to installation of equipment.
3. Performance Criteria: For products specified by performance criteria only, document conformance with design calculations or past performance records with list of previous installations and contact information.

B. Quality Control Submittals:

1. Certificates of Compliance: Submit certification that spray system complies with requirements of applicable codes, ordinances, rules, and regulations, ANSI/NSPI 1, and ANSI/ASME A112.19.8, and VGB.

C. Closeout Submittals:

1. Operation and Maintenance Data: Include data for water features and water feature equipment, and warranty information. Contractor shall supply four (4) complete Operation and Maintenance manuals for all products supplied in this project. The manuals shall be project specific, any general Operation and Maintenance manuals shall be rejected.
2. Maintenance manual shall have a complete system diagrams displaying the valve number, valve function, on specific system, and how to operate the system opening and closing valves.
3. Warranties.

4. Owner's Certificate of Instruction.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store water feature system components off ground and protect with waterproof covering.
- B. Protect piping and accessories from exposure to ultraviolet and from contact with chemicals that could cause damage or deterioration.

1.7 WARRANTIES

- A. Furnish filter and related items manufacturer's limited 1-year warranty against defective materials and workmanship, starting on the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Cartridge Filter

- 1. Provide the filter system. The filter system shall be a cartridge filter with capacity of 50 gallons per minute, providing 336 square feet filter area, when operating at a filtration application rate not to exceed 0.15 gallons per minute per square foot of filter area. The filter system shall provide model no. BF 336 Sand Filters manufactured by, Harmsco, or approved equal.
- 2. The filter shall include extra set of cartridges.

G. Pressure Gauges:

- 1. Provide pressure gauge for pump discharge mounted on panel attached to filter tank. Gauge(s) shall be at least 2 ½-inches in diameter, calibrated in psi for 0 to 60. Provide gauge cock and pressure tubing. Provide pressure gauge installed at pump discharge with rubber fitting.

H. Vacuum Gauges:

- 1. Provide compound gauge for pump suction port. Gauge(s) shall be at least 2 ½- inches in diameter. Gauge shall be calibrated to 30-inches hg vacuum and 0 to 60 psi.

I. Automatic Make-up Water Level System:

- 1. Fountain water level shall be maintained by an automatic water level make up controller
- 2. System shall consist of a water level probe, found in the collector tank.
- 3. Controller package shall consist of a control panel housing, a liquid level relay and delay timer; a self-housed 110 volt, 7-day/24 hour timer.
- 4. Water level shall be controlled by the use of a three-probe electrode system, two for high and low level and one ground. Electrodes shall be T316 stainless steel connected to a UL



approved probe holder. A mechanical linkage or float operated system will not be acceptable.

5. Solenoid valve size shall be as indicated on drawing, N.C., slow closing. Solenoid shall have a brass body, NBR Disc, PTFE Seals, 305 Stainless Steel Core Tube, 430 F Stainless Steel Core and Plugnut, 302 Stainless Steel springs. Electrical enclosure shall be NEMA 4 rated.
6. Probe and Controller shall be a model No WLC 200, manufactured by Neptune Benson, or approved equal.

J. Flowmeter:

1. Flowmeter shall be installed in the filter and boosted water feed. Flow Meter shall be a paddlewheel type, capable sensing flows from 0.4 to 8000 GPM. Shall have a digital screen and powered by batteries. Flowmeter shall be a model no F-1000, manufactured by Blue and White, or approved equal.

K. Pumps and Motors:

1. Pumps uses for the water features shall be listed below:

a. Pumps:

- i. Filter Pump: WFE-4 series Model No. 011513, 1 HP pump. Pump shall be designed for 50 GPM, at 70 TDH. Pump shall have a 3 phase, 208 volt motor. Pump shall be manufactured by Pentair, or approved equal. Pump shall have an integral strainer. Provide spare strainer basket.
- ii. Booster Pump: WFE-6 series Model No. 011514, 1.5 HP pump. Pump shall be designed for 90 GPM, at 55 TDH. Pump shall have a 3 phase, 208 volt motor. Pump shall be manufactured by Pentair, or approved equal. Pump shall have an integral strainer. Provide spare strainer basket.

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2. Motors:

- a. Totally enclosed, fan-cooled (TEFC) or open drip-proof (ODP), with hygroscopic insulation, service factor 1.15, insulation Class F, sized to operate at full load and speed, designed for continuous operation.
  - b. Motor starter with current interrupter overload.
  - c. Combination motor starters: Hand-off auto switch and positive overload heater coil; as manufactured by Furnas, Square D, or Westinghouse.
  - d. Electrical enclosures: NEMA 4 type, suitable for surface mounting.
3. Filter pump shall be vibration isolated. The pump shall be mounted on neoprene pads shall be placed between the concrete pedestal pump frame. Neoprene pads shall be equivalent to the Mason Industries Type Super W Pads. The pads shall be sized to provide minimum 0.15-inch static deflection under the weight of the pump.

4. All pumps shall be electrically interlocked with the chemical controller and system flow meter, and booster pump.

## 2.2 Variable Frequency Drives (VFDs)

- A. VFD will be installed with each filter pump or booster pump installed in this project. Each VFD shall match the horsepower of the pump motor, voltage, and phase. The pump shall have factory installed disconnects and by pass variable frequency drive for motor protection and thermal overload protection, voltage and surge limitation, integrated hand / off / auto switch with manual by pass.
  1. VFD shall have a factory installed digital display screen. Display screen shall display the motor operating parameters (HZ, Volts, and amps).
  2. VFD enclosure shall be a NEMA 4x enclosure.
  3. VFD shall be Model No. Unidrive manufactured by Emerson, or approved equal.
  4. VFD shall be wall mounted with enclosure (typical).

## 2.3 PIPING

- A. Valves and Piping:
  1. Piping: All materials and equipment shall be new, of best quality for the purpose intended, and shall be clearly marked with the manufacturer's name and nameplate, date, or stamp and rating. As far as practicable, materials and equipment shall be one manufacturer.
  2. Polyvinyl Chloride Pipe and Fittings:
    - a. Provide Class 12454 B polyvinyl chloride pipe for all pipes used for distributing chemical solutions. All pipes shall be Schedule 80.
    - b. Provide solvent weld type fittings for all chemical solutions distribution systems. A heavy duty industrial grade PVC solvent cement shall be used.
    - c. CPVC Schedule 80: Type 1, normal impact, NSF approved for solvent welding applications, for exposed piping. CPVC piping shall be used for the heating loop from the supply filtered effluent line to the heat exchanger and the heated effluent return from the heat exchanger back to the filtered effluent line.
  3. Flexible connectors:
    - a. All connections between the chemical proportional feed pumps and the rigid PVC pipe shall be of flexible plastic hose.
    - b. The hose shall consist of polyester braided reinforced tubing with a minimum rating of 150 psi.

- c. All materials, hardware components, and accessories shall be corrosion resistant. They shall be 316 stainless steel, fiberglass, high density resin, or PVC.
- 4. Cement: ASTM D2564.
- 5. Provide check and ball valves as required by Hayward.
  - a. Gate valves three inch (3-inch) and larger shall be PVC stainless steel mounted non-rising stem. Valves shall have flanged ends and shall be designed for a minimum water working pressure of 150 lbs. per square inch.
  - b. Butterfly Valves: Butterfly valves shall be EPDM seated with PVC disc and stainless steel shaft for chlorinated fountain water service. Furnish hand wheel/gear operators on all valves 8-inch and larger and valves indicated as throttle valve service.
  - c. Check Valves: Provide a corrosion resistant body, EPDM seated wafer type valve with bronze plates and shaft.
  - d. All valves 3-inch and larger shall be ASAHI EPDM butterfly valves or Hayward industrial PVC valves or approved equal.
  - e. All valves 3-inch and smaller shall be Spears True Union or approved equal.
- 6. Valve connections: Suitable for connection of adjoining pipe; of pipe size values.
- 7. Cement: ASTM D2564.
- 8. Valve connections: Suitable for connection of adjoining pipe; of pipe size values.
- 9. Hangers and supports: Sized to project conditions. Shall be stainless steel, or FRP, installed with stainless steel hardware.
- 10. All pipes shall be vibration isolated with a ½-inch thick neoprene pad between the strap and the pipe.
- 11. All valves shall be tagged and numbered with a 2-inch polyethylene identification tag coordinated into the O&M at the conclusion of the project.
- 12. All piping shall be identified with pipe labeling. Piping shall be marking indicating the direction of flow, and what vessel the filtered water is coming from. Labels shall be polyethylene pipe identification, shall be snap on and secured to the associated piping. Pipe labels shall be manufactured by Seton, or approved equal. Stickers or permanent marker shall be rejected.

#### 2.4 UV / OZONE

- A. UV / Ozone Unit shall be an Ozone Generator and low pressure UV disinfectant. Unit shall be powered from single phase, 240 volt unit with a NEMA 3 enclosure. Ozone cells shall have a minimum of a 5 year life expectancy, with 2" piping connections. Unit shall be a model no DEL AOP 50, manufactured by Del Ozone.

## 2.5 SKIMMER

- A. Provide a complete packaged automatic skimmer for placement in concrete.
- B. The skimmer shall be NSF approved.
- C. The skimmer shall have a flap weir and a rigid, perforated plastic basket, provide a spare basket.
- D. Materials: Skimmer shall be constructed of non-corrosive, no conductive material. Skimmer shall be square body with two (2) 2-inch slip connections.
- E. Provide Hayward Skim-Master Skimmer Model # SP1096, or approved equal.
- F. Skimmer basket cover shall be a custom bronze cover, completely covering all white portions of the cover. The bronze cover shall be equipped with screws that require a specialized tool to remove. Contractor shall supply the town with 5 sets of screws and tools for each skimmer.

## 2.6 FLOOR RETURNS

- A. Floor returns shall be a cast bronze body with threaded fittings. They shall have an integral waterstop flange. The inlet shall have an adjustable plate to adjust and diffuse flow. Floor return shall be model no 6092-4-615, manufactured by PEM, or approved equal.

## 2.7 FLOOR DRAINS

- A. Floor returns shall be a cast bronze body with threaded fittings. They shall have an integral waterstop flange. It shall have a threaded connection for a tight seal plug. Floor drain shall be model no 6094 – 4 – 6212, with the seal plug to be a model no 622 – 01, manufactured by PEM, or approved equal.

## PART 3 - EXECUTION

### 3.1 INSTALLATION:

- A. Install equipment and system in accordance with manufacturer's instructions and approved shop drawings.
- B. Set equipment on secure foundations.
- C. Make piping joints in accordance with ASTM D2855.
- D. Support overhead piping and at connections to valves, pumps, and equipment.
- E. Install electrical components in accordance with NFPA 70.

3.2 FIELD QUALITY CONTROL:

A. Water Treatment:

1. Submit chemical analysis of source water supply showing:
  - a. Total alkalinity in PPM.
  - b. Calcium hardness in PPM.
  - c. Chlorine in PPM.
  - d. pH.
  - e. Iron and Phosphorus.
2. Treat and balance spray feature water just prior to Substantial Completion.
  - a. Establish total alkalinity of 80 to 150 PPM and calcium hardness of 175 to 250 PPM.
  - b. Balance spray feature water to local health code requirements.
  - c. Contractor shall furnish all balancing chemical and labor to balance and maintain the spray feature(s) prior to acceptance by the board of health.

3.3 ADJUSTING:

- A. Adjust spray feature system for proper operation through all cycles.

3.4 CLEANING:

- A. Clean equipment, and related surfaces.

3.5 DEMONSTRATION:

- A. Demonstrate proper operation and maintenance of fountain systems to Owner.

3.6 TESTING:

- A. All piping shall be pressured tested to 35 psi, for duration of 2 hours. The test shall be witnessed by the Owner, or Owner Representative. If the test fails, the repair must be performed, and a new test shall be performed. Pressure shall be maintained on the piping until the system is commissioned.

3.7 PROTECTION, MANUALS AND INSTRUCTIONS:

- A. Protection: The Water feature Contractor shall use whatever methods are required to protect water feature equipment from deterioration during remainder of the construction period.

- B. Manuals and Instructions: Start up, test, and operate the completed system to verify its performance in compliance with Contract Documents, and to meet approval of governing authorities. Coordinate fountain-filling schedule with work of other Sections and, after finish work is cured, circulate and treat water until Owner accepts installation.
1. Provide complete operating and maintenance manuals for water features and equipment. Provide four (4) sets.
  2. After approval of submission of manuals, instruct Owner's personnel in the operation, use and maintenance of the entire installation and each operating element, for a total of 16 hours with selected manufacturers' training representatives. Final acceptance will not be made until training is complete to Owner's satisfaction.
  3. Provide Warning Rules and Regulations sign as required by Federal, State, OSHA, and Local code, and Health Codes.
  4. Provide four (4) packages of items above.
  5. Contractor shall, operate the system until acceptance and approval by health department.

END OF SECTION

## SECTION 26 00 50

### ELECTRICAL WORK - GENERAL PROVISIONS

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

- A. The Contractor shall furnish all labor, materials, equipment and incidentals required to make ready for use the complete electrical systems as shown on the Drawings and as specified hereinafter.
- B. In conjunction with other sections of Division 26, the work shall include but not be limited to furnishing and installing the following:
  - 1. Underground Secondary Services
  - 2. Transformers
  - 3. Lighting Fixtures
  - 4. Grounding System
  - 5. Bonding materials
  - 6. Panelboards
  - 7. Raceways
  - 8. Feeder and Branch Circuit Conductors
  - 9. Hangers and Supports
  - 10. Solderless Lugs and Connectors.

- 11. Conduit and wire for equipment and controls furnished under other divisions of the specifications, when shown on the electrical plans.
  - C. Make all necessary connections at "packaged" equipment furnished under other sections and Divisions of these specifications.
  - D. Make all connections to equipment and devices furnished under Division 26 and other sections of these specifications except as otherwise specified.
  - E. Connect process and instrumentation cables furnished with field-mounted equipment under other sections and Divisions of these specifications.
  - F. It is the intent of these specifications that the electrical system shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this section shall be furnished at no extra cost to the Owner.
- 1.02 RELATED WORK:
- A. The Contractor's attention is directed to the General Conditions, Supplementary Conditions.
- 1.03 CODES, INSPECTIONS, PERMITS AND FEES:
- A. All material and installations shall be in accordance with the latest edition of the Massachusetts Electrical Code (527 CMR 12.00) and all applicable local codes and ordinances.
  - B. Obtain all necessary permits and pay all fees for permits and inspections.
- 1.04 INTERPRETATION OF DRAWINGS:
- A. The Drawings are not intended to show exact locations of conduit runs.
  - B. Each three-phase circuit shall be run in a separate conduit unless otherwise shown on the Drawings.
  - C. Unless otherwise noted and/or approved by the Engineer all conduits shall be installed concealed.
  - D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation.



- E. Any work installed contrary to or without review by the Engineer shall be subject to change as required by the Engineer, and no extra compensation will be allowed for making these changes.
- F. The locations of equipment, shown on the drawings are approximate only. Exact locations shall be as determined by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as required by the Engineer and furnish all labor and materials necessary to complete the work in an acceptable manner.
- G. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.
- H. All connections to equipment shall be made as required and in accordance with the approved shop and setting drawings.

1.05 SUBMITTALS:

In accordance with requirements of general specifications, submit the following:

- A. Complete shop drawings shall be submitted for but not limited to the following equipment: panelboards, service cabinets, load centers, conduit and wire.
- B. The manufacturer's name, product designation or catalog number, descriptive literature and data shall be submitted for the following material and equipment:
  - 1. Conduit
  - 2. Boxes and fittings
  - 3. Wires, cables and appurtenances
  - 4. Wiring devices and appurtenances
  - 5. Circuit breakers
  - 6. Panelboards
  - 7. Grounding Equipment
  - 8. Control devices and stations
- C. Prior to submittal, all shop drawings shall be checked for accuracy and conformance to contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to the specifications and drawings. This statement shall also list all discrepancies with the specifications and drawings. Shop drawings not so checked and noted shall be returned.

- D. The Engineer's review shall be only for conformance with the design concept of the project and compliance with the specifications and drawings. The responsibility of, and the necessity of, furnishing materials and workmanship required by the specifications and drawings which may not be indicated on the shop drawings is included under the work of this section.
- E. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this section.

1.06 MANUFACTURER'S SERVICES:

Furnish manufacturer's services for testing and start-up when required.

1.07 ELECTRIC SERVICES:

- A. The electric service for the new vault shall come from the existing panel PP1 in the town hall basement via an existing conduit as indicated on the drawings.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials, where not specified, shall be of the very best of their respective kinds. Samples of materials or manufacturer's specifications shall be submitted for review as required by the Engineer.
- B. Materials and equipment used shall be Underwriters' Laboratories, Inc. listed.
- C. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of- doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired at no additional cost. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as required by the Engineer or shall be replaced at no additional cost to the Owner.
- D. The Contractor's attention is directed to the requirements of the various sections of division 26.

2.02 MANUFACTURER'S NAMEPLATES:

- A. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information may be die-stamped into the surface of the equipment or may be marked on durable nameplates permanently fastened to the equipment.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Provide and place all sleeves for conduit penetrations through floors, walls, partitions, etc. Locate all necessary slots and inserts for electrical work and place in form before concrete is poured.
- B. Equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably to insure that the tilting does not impair the functional integrity of the equipment.

#### 3.02 RECORD DRAWINGS:

As the work progresses, legibly record (red line) all field changes on a set of project contract drawings. Prior to Substantial Completion of the project, submit the red lined prints to the Engineer for use in preparation of the record drawings.

#### 3.03 TESTS AND ADJUSTMENTS:

- A. Test all systems furnished under Division 26 and repair or replace all defective work. Make all necessary adjustments to the systems and equipment and instruct the Owner's personnel in the proper operation of the systems and equipment.

END OF SECTION

## SECTION 26 00 61

### ELECTRICAL BONDING

#### PART 1 - GENERAL

##### 1.01 RELATED DOCUMENTS

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1, General Requirements, are hereby made a part of the work of this Section. Where paragraphs of this Section conflict with Division 1, the more stringent requirements shall govern.
- B. All work shall comply with all federal, state and local codes and any other authorities having jurisdiction including any special requirements of the Owner or Engineer.
- C. Furnish all labor, materials, and equipment necessary to complete all work as shown on drawings and specified. This work is to include but not limited to the following: furnish and install splash pad bonding grid, wire and bonding to splash pad equipment as indicated on contract drawings.

##### 1.02 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Additional division 26 sections as applicable.
- C. Reference Drawings: The Work of this Section is shown on the Contract Drawings.

##### 1.03 REFERENCES

- A. All work shall conform to the 2017 (NEC) National Electrical Code, Massachusetts Electric Code, and all Federal, State and Local Codes as applicable.
- B. NEC Article 680 Swimming Pools, Fountains, and Similar Installations applies to this work.
- C. All products shall be UL listed.

## 1.04 QUALITY ASSURANCE

- A. Demonstrate the correct operation of all installed equipment and circuits to the satisfaction and requirements of the engineer.

## PART 2-PRODUCTS

### 2.01 WIRE

- A. Aluminum conductors shall not be used.
- B. Single conductors in shall be bare copper.

### 2.02 SPLICES

- A. Where splices are required, provide using one of the two following methods:
- B. Compression connectors of approved pattern
- C. Exothermic welded connections.
- D. Provide approved manufacturers watertight splice kits to insulate all splices.

### 2.03 IDENTIFICATION

- A. Underground buried electric wire marking tape shall be heavy-duty 0.0045", metal detection tape, 2" wide supplied in continuous lengths up to 1000'. Tape shall have red with black lettering, continuously duplicated, wording equal to "CAUTION BURIED ELECTRIC LINE BELOW".

## PART 3 - EXECUTION

### 3.01 COORDINATION

- A. Coordinate for connection of all reinforcing steel and splash pad equipment bonds before surface is applied.
- B. Coordinate installation of splash pad bonding at beginning of project. Electrician must be present to perform his work before concrete is applied.

### 3.02 UNDERGROUND WIRES OUTSIDE OF PAD PERIMETER

- A. Provide red marking tape buried 6" to 10" below surface indicating any buried bond wires below that extend beyond the perimeter of the pad.

### 3.03        INSTALLATION, SPLASH PAD BOND

#### SYSTEM

- A.     Furnish and install any Code required ground rods.
- B.     Contractor to provide #8 CU bond wire for pad steel, any metal drains, splash pad equipment and all other metallic components within 5'-0" as prescribed in NEC article 680.
- C.     Provide and install 600volt bonding conductors throughout the bonding system with connection to each item of equipment, etc. No conductors shall be exposed above the deck.
- D.     Bonding conductors shall be continuous, where ever possible.
- E.     Insulate any splices with approved insulation kit and makeup water tight to protect from corrosion and maintain the integrity of the splice.

END OF SECTION

## SECTION 26 05 19

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Copper wire rated 600 V or less.
2. Connectors, splices, and terminations rated 600 V and less.

##### 1.02 ACTION SUBMITTALS

###### A. Product Data: For each type of product.

##### 1.03 INFORMATIONAL SUBMITTALS

###### A. Field quality-control reports.

#### PART 2 - PRODUCTS

##### 2.01 COPPER BUILDING WIRE

###### A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

###### B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Alpha Wire Company.
2. American Bare Conductor.
3. Belden Inc.
4. Okonite Company (The).
5. Southwire Company.

###### C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. RoHS compliant.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.

E. Conductor Insulation:

1. Type RHH and Type RHW-2: Comply with UL 44.
2. Type THHN and Type THWN-2: Comply with UL 83.
3. Type XHHW-2: Comply with UL 44.

## 2.02 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. 3M Electrical Products.
2. AFC Cable Systems; a part of Atkore International.
3. Hubbell Power Systems, Inc.
4. O-Z/Gedney; a brand of Emerson Industrial Automation.
5. Thomas & Betts Corporation; A Member of the ABB Group.

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: One hole with standard barrels.
3. Termination: Compression.

## PART 3 - EXECUTION

### 3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.



- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type XHHW, USE single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway
- C. Exposed Branch Circuit: Type THHN-THWN, single conductors in raceway.
- D. Underground Feeders and Branch Circuits: Type UF multiconductor cable.

### 3.03 INSTALLATION OF CONDUCTORS AND CABLES

- A. Complete raceway installation between conductor and cable termination points according to Section 26 05 33 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

### 3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 12-inches of slack.

3.05 IDENTIFICATION

- A. Identify and color-code conductors and cables.
- B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.06 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

END OF SECTION

## SECTION 26 05 26

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section includes grounding and bonding systems and equipment.
- B. Section includes grounding and bonding systems and equipment.

##### 1.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.

##### 1.03 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article.
- B. Qualification Data: For testing agency and testing agency's field supervisor.
- C. Field quality-control reports

##### 1.04 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.
  - 1. Plans showing as-built, dimensioned locations of grounding features specified in "Field Quality Control" Article, including the following:
    - a. Ground rods.
    - b. Grounding arrangements and connections for separately derived systems.
  - 2. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.
    - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
    - b. Include recommended testing intervals.

## 1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Certified by NETA.

## PART 2 - PRODUCTS

### 2.01 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

### 2.02 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Burndy; Part of Hubbell Electrical Systems.
  - 2. ERICO International Corporation.
  - 3. Harger Lightning & Grounding.
  - 4. O-Z/Gedney; a brand of Emerson Industrial Automation.
  - 5. SIEMENS Industry, Inc.; Energy Management Division.
  - 6. Thomas & Betts Corporation; A Member of the ABB Group.

### 2.03 CONDUCTORS

- A. Retain "Insulated Conductors" Paragraph below to require one of two preferred conductor materials permitted by NFPA 70; delete to allow Contractor to use any material that complies with Code. See "Grounding Products" Article in the Evaluations for discussion on alternative materials.
- B. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- C. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Cable: 28 kc mil, 14 strands of No. 17 AWG conductor, 1/4-inch in diameter.

5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/-inches wide and 1/16-inch thick.

## 2.04 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Conduit Hubs: Mechanical type, terminal with threaded hub.
- G. Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.
- H. Service Post Connectors: Mechanical type, bronze alloy terminal, in short- and long-stud lengths, capable of single and double conductor connections.
- I. Signal Reference Grid Clamp: Mechanical type, stamped-steel terminal with hex head screw.
- J. Straps: Solid copper, copper lugs. Rated for 600 A.

## PART 3 - EXECUTION

### 3.01 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor.
  1. Bury at least 24-inches below grade.

C. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except as otherwise indicated.

3.02 GROUNDING AT THE SERVICE

- A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

3.03 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
1. Feeders and branch circuits.
  2. Lighting circuits.
  3. Receptacle circuits.

3.04 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
  2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
  3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

### 3.05 FIELD QUALITY CONTROL

- A. "Perform tests and inspections" Paragraph below to require Contractor to perform tests and inspections.
- B. Tests and Inspections:
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
  - 3. Test completed grounding system at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
  - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION

## SECTION 26 05 33

### RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetallic conduits and fittings.
3. Nonmetal wireways and auxiliary gutters.
4. Surface raceways.
5. Boxes, enclosures, and cabinets.

##### 1.02 ACTION SUBMITTALS

- ###### A. Product Data: For each type of product.
- ###### B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

#### PART 2 - PRODUCTS

##### 2.01 METAL CONDUITS AND FITTINGS

###### A. Metal Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Allied Tube & Conduit; a part of Atkore International.
  - c. Anamet Electrical, Inc.
  - d. Opti-Com Manufacturing Network, Inc (OMNI).
  - e. O-Z/Gedney; a brand of Emerson Industrial Automation.
2. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. GRC: Comply with ANSI C80.1 and UL 6.
4. IMC: Comply with ANSI C80.6 and UL 1242.



5. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
  - a. Comply with NEMA RN 1.
  - b. Coating Thickness: 0.040-inch, minimum.
6. EMT: Comply with ANSI C80.3 and UL 797.
7. FMC: Comply with UL 1; zinc-coated steel or aluminum.
8. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

B. Metal Fittings: Comply with NEMA FB 1 and UL 514B.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Allied Tube & Conduit; a part of Atkore International.
  - c. Anamet Electrical, Inc.
  - d. FSR Inc.
  - e. O-Z/Gedney; a brand of Emerson Industrial Automation.
2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. Fittings, General: Listed and labeled for type of conduit, location, and use.
4. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 1203 and NFPA 70.
5. Fittings for EMT:
  - a. Material: Steel.
  - b. Type: Setscrew.
6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
7. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040-inch, with overlapping sleeves protecting threaded joints.

C. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

## 2.02 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. AFC Cable Systems; a part of Atkore International.
  - b. Anamet Electrical, Inc.
  - c. FRE Composites.
  - d. RACO; Hubbell.
  - e. Thomas & Betts Corporation; A Member of the ABB Group.
- B. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  1. ENT: Comply with NEMA TC 13 and UL 1653.
  2. RNC: Type EPC-80-PVC as noted complying with NEMA TC 2 and UL 651 unless otherwise indicated.
  3. LFNC: Comply with UL 1660.
- C. Nonmetallic Fittings:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. AFC Cable Systems; a part of Atkore International.
    - b. Anamet Electrical, Inc.
    - c. Arnco Corporation.
    - d. FRE Composites.
    - e. RACO; Hubbell.
  2. Fittings, General: Listed and labeled for type of conduit, location, and use.
  3. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
  4. Fittings for LFNC: Comply with UL 514B.
  5. Solvents and Adhesives: As recommended by conduit manufacturer.

## 2.03 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  1. Crouse-Hinds, an Eaton business.
  2. Erickson Electrical Equipment Company.
  3. Hoffman; a brand of Pentair Equipment Protection.
  4. Hubbell Incorporated.

- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- F. Device Box Dimensions: as required for the use.
- G. Gangable boxes are prohibited.

## 2.04 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes:
  - 1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
  - 2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Armorcast Products Company.
    - b. NewBasis.
    - c. Oldcastle Enclosure Solutions.
    - d. Oldcastle Precast, Inc.
    - e. Quazite: Hubbell Power Systems, Inc.
  - 2. Standard: Comply with SCTE 77.
  - 3. Configuration: Designed for flush burial with closed bottom unless otherwise indicated.
  - 4. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
  - 5. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
  - 6. Cover Legend: Molded lettering, "ELECTRIC." or per appropriate system.
  - 7. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

## PART 3 - EXECUTION

### 3.01 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: GRC.
  - 2. Underground Conduit: RNC, Type EPC-80-PVC, direct buried or concrete encased as indicated on plans.
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4X
- B. Minimum Raceway Size: 3/4-inch trade size.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
  - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  - 3. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
  - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- D. Install surface raceways only where indicated on Drawings.
- E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

### 3.02 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- C. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12-inches of changes in direction.
- D. Support conduit within 12-inches of enclosures to which attached.

- E. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- F. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- H. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- I. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12-inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- J. Surface Raceways:
  - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
- K. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.
- L. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where an underground service raceway enters a building or structure.
  - 3. Where otherwise required by NFPA 70.
- M. Expansion-Joint Fittings:
  - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet.
  - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.

- b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
  - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
- 3. Install fitting(s) that provide expansion and contraction for at least 0.00041-inch per foot of length of straight run per degree F of temperature change for PVC conduits.
- 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
- 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- N. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72-inches of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- O. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- P. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- Q. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

### 3.03 INSTALLATION OF UNDERGROUND CONDUIT

#### A. Direct-Buried Conduit:

- 1. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12-inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

2. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.

### 3.04 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Retain this article if Project includes small amounts of exterior underground wiring 600 V and less.
- B. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- C. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.
- D. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1-inch above finished grade.
- E. Install handholes with bottom below frost line.
- F. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

### 3.05 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies.

### 3.06 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

## SECTION 26 24 16

### PANELBOARDS

#### PART 1 - GENERAL

##### 1.01 SUMMARY

###### A. Section Includes:

1. Lighting and appliance branch-circuit panelboards.

##### 1.02 DEFINITIONS

- A. MCCB: Molded-case circuit breaker.
- B. SPD: Surge protective device.

##### 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
- B. Shop Drawings: For each panelboard and related equipment.
  1. Include dimensioned plans, elevations, sections, and details.
  2. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
  3. Detail bus configuration, current, and voltage ratings.
  4. Short-circuit current rating of panelboards and overcurrent protective devices.
  5. Include evidence of NRTL listing for SPD as installed in panelboard.
  6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  7. Include wiring diagrams for power, signal, and control wiring.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Panelboard schedules for installation in panelboards.



## 1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

## 1.06 FIELD CONDITIONS

- A. Service Conditions: NEMA PB 1, usual service conditions, as follows:

- 1. Ambient temperatures within limits specified.
- 2. Altitude not exceeding 6600 feet.

## 1.07 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

- 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Surface -mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    - b. Other Wet or Damp Indoor Locations: NEMA 250, Type 4X.
  - 2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.

3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
- F. Incoming Mains Location: Top or Bottom.
  - G. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.
  - H. Conductor Connectors: Suitable for use with conductor material and sizes.
    1. Material: Hard-drawn copper, 98 percent conductivity.
    2. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
    3. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
  - I. Future Devices: Panelboards shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
  - J. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

## 2.02 PERFORMANCE REQUIREMENTS

- A. Retain "Seismic Performance" Paragraph for projects requiring seismic design. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Verify requirements of authorities having jurisdiction.
- B. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
- C. Surge Suppression: Factory installed as an integral part of indicated panelboards, complying with UL 1449 SPD Type 2.

## 2.03 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Panelboards, as specified in this article, comply with requirements of "Lighting and Appliance Branch-Circuit Panelboards" in NEMA PB 1.

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- C. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- D. Mains: Circuit breaker.
- E. Branch Overcurrent Protective Devices: Plug-in or Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- F. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

#### 2.04 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - 1. Eaton.
  - 2. General Electric Company; GE Energy Management - Electrical Distribution.
  - 3. SIEMENS Industry, Inc.; Energy Management Division.
  - 4. Square D; by Schneider Electric.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
  - 1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

## 2.05 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Comply with NECA 1.
- B. Install panelboards and accessories according to NECA 407.
- C. Mount panelboard cabinet plumb and rigid without distortion of box.
- D. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
- E. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- F. Install filler plates in unused spaces.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 3.02 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components.
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification.

- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate

### 3.03 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
  - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  - 2. Test continuity of each circuit.
- C. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections.

END OF SECTION

## SECTION 26 27 26

### WIRING DEVICES

#### PART 1 - GENERAL

##### 1.01 SUMMARY

- A. Section Includes:
  - 1. GFCI receptacles.
  - 2. Toggle switches.
  - 3. Wall plates.

##### 1.02 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
  - 1. Cooper: Copper Wiring Devices; Division of Cooper Industries, Inc.
  - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
  - 3. Leviton: Leviton Mfg. Company, Inc.
  - 4. Pass & Seymour: Pass& Seymour/Legrand.

##### 1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

##### 1.04 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

##### 1.05 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

## PART 2 - PRODUCTS

### 2.01 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
  - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
  - 2. Devices shall comply with the requirements in this Section.
- D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.
- E. Devices for Owner-Furnished Equipment:
  - 1. Receptacles: Match plug configurations

### 2.02 GFCI RECEPTACLES

- A. Non-feed-through-type GFCI unit shall be selected where no protection of downstream receptacles is required.
- B. General Description:
  - 1. 125 V, 20 A, straight blade, feed-through type.
  - 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
  - 3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- C. Duplex GFCI Convenience Receptacles:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (Arrow Hart).
    - b. Hubbell Incorporated; Wiring Device-Kellems.

- c. Leviton Manufacturing Co., Inc.
- d. Pass & Seymour/Legrand (Pass & Seymour).

## 2.03 TOGGLE SWITCHES

- A. Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A:
  - 1. Single Pole:
    - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
      - 1) Eaton (Arrow Hart).
      - 2) Hubbell Incorporated; Wiring Device-Kellems.
      - 3) Leviton Manufacturing Co., Inc.
      - 4) Pass & Seymour/Legrand (Pass & Seymour).

## 2.04 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: High-impact thermoplastic in finished spaces.
  - 3. Material for Unfinished Spaces: Galvanized steel.
  - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with cover.

## 2.05 FINISHES

- A. Device Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.



## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.
    - c. Pig tailing existing conductors is permitted, provided the outlet box is large enough.
- D. Device Installation:
  - 1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6-inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. GFCI Receptacles: Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

### 3.02 FIELD QUALITY CONTROL

A. Test Instruments: Use instruments that comply with UL 1436.

B. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

C. Perform the following tests and inspections:

1. Tests for Convenience Receptacles:

- a. Line Voltage: Acceptable range is 105 to 132 V.
- b. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
- c. Using the test plug, verify that the device and its outlet box are securely mounted.

- d. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- D. Wiring device will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION

## SECTION 31 00 00

### EARTHWORK

#### PART 1 - GENERAL

##### 1.01 WORK INCLUDED:

The Contractor shall make excavations of normal depth in earth for trenches and structures, shall backfill and compact such excavations to the extent necessary, shall furnish the necessary material and construct embankments and fills, and shall make miscellaneous earth excavations and do miscellaneous grading.

##### 1.02 RELATED WORK:

- A. Section 00 31 43, PERMITS
- B. Section 01 11 00, CONTROL OF WORK AND MATERIALS
- C. Section 01 57 19, ENVIRONMENTAL PROTECTION
- D. Section 32 91 19, LOAMING AND SEEDING
- E. Section 32 93 00, LANDSCAPING

##### 1.03 REFERENCES:

###### American Society for Testing and Materials (ASTM)

ASTM	C131	Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
ASTM	C136	Method for Sieve Analysis of Fine and Coarse Aggregates.
ASTM	C330	Specification for Lightweight Aggregate for Structural Concrete.
ASTM	D1556	Test Method for Density of Soil in Place by the Sand Cone Method.
ASTM	D1557	Test Methods for Moisture-density Relations of Soils and Soil Aggregate Mixtures Using Ten-pound (10 Lb.) Hammer and Eighteen-inch (18") Drop.
ASTM	D2922	Test Methods for Density of Soil and Soil-aggregate in Place by Nuclear Methods (Shallow Depth).

Massachusetts Department of Transportation (MassDOT) Standard Specifications for Highways and Bridges.

Code of Massachusetts Regulations (CMR) 310.40.0032 Contaminated Media and Contaminated Debris

Code of Massachusetts Regulations (CMR) 520 CMR 14.00 Excavation & Trench Safety Regulation

1.04 SUBMITTALS: IN ACCORDANCE WITH REQUIREMENTS OF GENERAL SPECIFICATIONS, SUBMIT THE FOLLOWING:

Samples of all materials proposed for the project shall be submitted to the Engineer for review. Size of the samples shall be as approved by the Engineer.

1.05 PROTECTION OF EXISTING PROPERTY:

- A. The work shall be executed in such manner as to prevent any damage to facilities at the site and adjacent property and existing improvements, such as but not limited to streets, curbs, paving, service utility lines, structures, monuments, bench marks, observation wells, and other public or private property. Protect existing improvements from damage caused by settlement, lateral movements, undermining, washout and other hazards created by earthwork operations.
- B. In case of any damage or injury caused in the performance of the work, the Contractor shall, at its own expense, make good such damage or injury to the satisfaction of, and without cost to, the Owner. Existing roads, sidewalks, and curbs damaged during the project work shall be repaired or replaced to at least the condition that existed at the start of operations. The Contractor shall replace, at his own cost, existing benchmarks, observation wells, monuments, and other reference points, which are disturbed or destroyed.
- C. Buried drainage structures and pipes, observation wells and piezometers, including those which project less than eighteen inches (18") above grade, which are subject to damage from construction equipment shall be clearly marked to indicate the hazard. Markers shall indicate limits of danger areas, by means which will be clearly visible to operators of trucks and other construction equipment, and shall be maintained at all times until completion of project.

1.06 DRAINAGE:

- A. The Contractor shall provide, at its own expense, adequate drainage facilities to complete all work items in an acceptable manner. Drainage shall be done in a manner so that runoff will not adversely affect construction procedures or cause excessive disturbance of underlying natural ground or abutting properties.

1.07 FROST PROTECTION AND SNOW REMOVAL:

- A. The Contractor shall, at its own expense, keep earthwork operations clear and free of accumulations of snow as required to carry out the work.

- B. The Contractor shall protect the subgrade beneath new structures and pipes from frost penetration when freezing temperatures are expected.

## PART 2 - PRODUCTS

### 2.01 MATERIALS:

#### A. GRAVEL BORROW:

Gravel Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.03.0, Type b.

#### B. CRUSHED STONE:

Crushed stone shall satisfy the requirements listed in MassDOT Specification Section M2.01.

#### C. SAND BORROW:

Sand Borrow shall satisfy the requirements listed in MassDOT Specification Section M1.04.0.

#### D. PEASTONE:

Peastone shall be smooth, hard, naturally occurring, rounded stone meeting the following gradation requirements:

Passing 5/8 inch square sieve opening	-	100%
Passing No. 8 sieve opening	-	0%

#### E. BACKFILL MATERIALS:

##### 1. Class B Backfill:

Class B backfill shall be granular, well graded friable soil; free of rubbish, ice, snow, tree stumps, roots, clay and organic matter; with 30 percent or less passing the No. 200 sieve; no stone greater than two-third (2/3) loose lift thickness, or six inches, whichever is smaller.

##### 2. Select Backfill:

Select backfill shall be granular, well graded friable soil, free of rubbish, ice, snow, tree stumps, roots, clay and organic matter, and other deleterious or organic material; graded within the following limits:

<u>Sieve Size</u>	<u>Percent Finer by Weight</u>
3"	100
No. 10	30-95
No. 40	10-70
No. 200	0-10

E. SPECIAL PIPE BEDDING MATERIAL

1. The special pipe bedding material shall consist of a filter fabric installed on the trench bottom before backfilling with crushed stone as specified and as shown on the contract drawings.

F. PROCESSED GRAVEL:

1. Processed gravel shall consist of inert material that is hard, durable stone and coarse sand, free from loam and clay, surface coatings and deleterious materials. The coarse aggregate shall have a percentage of wear, by the Los Angeles Abrasion Test, of not more than 50.
2. The gradation shall meet the following requirements:

<u>Sieve Designation</u>	<u>Percentage Passing</u>
3 in.	100
1 1/2 in.	70-100
3/4 in.	50-85
No. 4	30-60
No. 200	0-10

3. The approved source of bank-run gravel material shall be processed by mechanical means. The equipment for producing crushed gravel shall be of adequate size with sufficient adjustments to produce the desired materials. The processed material shall be stockpiled in such a manner to minimize segregation of particle sizes. All processed gravel shall come from approved stockpiles.

PART 3 - EXECUTION

3.01 DISTURBANCE OF EXCAVATED AND FILLED AREAS DURING CONSTRUCTION:

- A. Contractor shall take the necessary steps to avoid disturbance of subgrade during excavation and filling operations, including restricting the use of certain types of construction equipment and their movement over sensitive or unstable materials, dewatering and other acceptable control measures.
- B. All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that will not meet compaction requirements as specified herein shall be

removed and replaced with a minimum 12-inch layer of compacted crushed stone wrapped all around in non-woven filter fabric. Costs of removal and replacement shall be borne by the Contractor.

- C. The Contractor shall place a minimum of 12-inch layer of special bedding materials and crushed stone wrapped in filter fabric over the natural underlying soil to stabilize areas which may become disturbed as a result of rain, surface water runoff or groundwater seepage pressures, all at no additional cost to the Owner. The Contractor also has the option of drying materials in-place and compacting to specified densities.

### 3.02 EXCAVATION:

#### A. GENERAL:

1. The Contractor shall perform all work of any nature and description required to accomplish the work as shown on the Drawings and as specified.
2. Excavations, unless otherwise required by the Engineer, shall be carried only to the depths and limits shown on the Drawings. If unauthorized excavation is carried out below required subgrade and/or beyond minimum lateral limits shown on Drawings, it shall be backfilled with gravel borrow and compacted at the Contractor's expense as specified below, except as otherwise indicated. Excavations shall be kept in dry and good conditions at all times, and all voids shall be filled to the satisfaction of the Engineer.
3. In all excavation areas, the Contractor shall strip the surficial topsoil layer and underlying subsoil layer separate from underlying soils. In paved areas, the Contractor shall first cut pavement as specified in paragraph 3.02 B.1 of this specification, strip pavement and pavement subbase separately from underlying soils. All excavated materials shall be stockpiled separately from each other within the limits of work.
4. The Contractor shall follow a construction procedure, which permits visual identification of stable natural ground. Where groundwater is encountered, the size of the open excavation shall be limited to that which can be handled by the Contractor's chosen method of dewatering and which will allow visual observation of the bottom and backfill in the dry.
5. The Contractor shall excavate unsuitable materials to stable natural ground where encountered at proposed excavation subgrade, as required by the Engineer. Unsuitable material includes topsoil, loam, peat, other organic materials, snow, ice, and trash. Unless specified elsewhere or otherwise required by the Engineer, areas where unsuitable materials have been excavated to stable ground shall be backfilled with compacted special bedding materials or crushed stone wrapped all around in non-woven filter fabric.



B. TRENCHES:

1. Prior to excavation, trenches in pavement shall have the traveled way surface cut in a straight line by a concrete saw or equivalent method, to the full depth of pavement. Excavation shall only be between these cuts. Excavation support shall be provided as required to avoid undermining of pavement. Cutting operations shall not be done by ripping equipment.
2. The Contractor shall satisfy all dewatering requirements specified in Section 31 23 19 DEWATERING, before performing trench excavations.
3. Trenches shall be excavated to such depths as will permit the pipe to be laid at the elevations, slopes, and depths of cover indicated on the Drawings. Trench widths shall be as shown on the Drawings or as specified.
4. Where pipe is to be laid in bedding material, the trench may be excavated by machinery to, or just below, the designated subgrade provided that the material remaining in the bottom of the trench is not disturbed.
5. If pipe is to be laid in embankments or other recently filled areas, the fill material shall first be placed to a height of at least 12-inches above the top of the pipe before excavation.
6. Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed.
7. If, in the opinion of the Engineer, the subgrade, during trench excavation, has been disturbed as a result of rain, surface water runoff or groundwater seepage pressures, the Contractor shall remove such disturbed subgrade to a minimum of 12 inches and replace with crushed stone wrapped in filter fabric. Cost of removal and replacement shall be borne by the Contractor.
8. The Contractor shall obtain a trench permit from the municipality where the trench is located prior to making any excavations of trenches (any subsurface excavation greater than three (3) feet in depth and fifteen (15) feet or less between soil walls as measured from the bottom).
9. All trenches required to be permitted must be attended, covered, barricaded, or backfilled. Covers must be road plates at least ¾-inch thick or equivalent, barricades must be fences at least 6-feet high with no openings greater than 4-inches between vertical supports and all horizontal supports required to be located on the trench-side of the fencing.

C. EXCAVATION NEAR EXISTING STRUCTURES:

1. Attention is directed to the fact that there are pipes, manholes, drains, and other utilities in certain locations. An attempt has been made to locate all utilities on the

drawings, but the completeness or accuracy of the given information is not guaranteed.

2. As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and excavation shall be done by means of hand tools, as required. Such manual excavation, when incidental to normal excavation, shall be included in the work to be done under items involving normal excavation.
3. Where determination of the exact location of a pipe or other underground structure is necessary for properly performing the work, the Contractor shall excavate test pits to determine the locations.

### 3.03 BACKFILL PLACEMENT AND COMPACTION:

#### A. GENERAL:

1. Prior to backfilling, the Contractor shall compact the exposed natural subgrade to the densities as specified herein.
2. After approval of subgrade by the Engineer, the Contractor shall backfill areas to required contours and elevations with specified materials.
3. The Contractor shall place and compact materials to the specified density in continuous horizontal layers, not to exceed nine (9) inches in uncompacted lifts. The degree of compaction shall be based on maximum dry density as determined by ASTM Test D1557, Method C. The minimum degree of compaction for fill placed shall be as follows:

<u>Location</u>	<u>Percent of Maximum Density</u>
Below pipe centerline	95
Above pipe centerline	92
Below pavement (upper 3 ft.)	95
Embankments	95
Below pipe in embankments	95
Adjacent to structures	92
Below structures	95

4. The Engineer reserves the right to test backfill for conformance to the specifications and Contractor shall assist as required to obtain the information. Compaction testing will be performed by the Engineer or by an inspection laboratory designated by the Engineer, engaged and paid for by the Owner. If test results indicate work does not conform to specification requirements, the Contractor shall remove or correct the defective Work by recompacting where appropriate or replacing as necessary and approved by the Engineer, to bring the work into compliance, at no additional cost to the Owner. All backfilled materials under structures and

buildings shall be field tested for compliance with the requirements of this specification.

5. Where horizontal layers meet a rising slope, the Contractor shall key each layer by benching into the slope.
6. If the material removed from the excavation is suitable for backfill with the exception that it contains stones larger than permitted, the Contractor has the option to remove the oversized stones and use the material for backfill or to provide replacement backfill at no additional cost to the Owner.
7. The Contractor shall remove loam and topsoil, loose vegetation, stumps, large roots, etc., from areas upon which embankments will be built or areas where material will be placed for grading. The subgrade shall be shaped as indicated on the Drawings and shall be prepared by forking, furrowing, or plowing so that the first layer of the fill material placed on the subgrade will be well bonded to the subgrade.

B. TRENCHES:

1. Bedding as detailed and specified shall be furnished and installed beneath the pipeline prior to placement of the pipeline. A minimum bedding thickness shall be maintained between the pipe and undisturbed material, as shown on the Drawings.
2. As soon as practicable after pipes have been laid, backfilling shall be started.
3. Unless otherwise indicated on the Drawings, select backfill shall be placed by hand shovel in 6-inch thick lifts up to a minimum level of 12-inches above the top of pipe. This area of backfill is considered the zone around the pipe and shall be thoroughly compacted before the remainder of the trench is backfilled. Compaction of each lift in the zone around the pipe shall be done by use of power-driven tampers weighing at least 20 pounds or by vibratory compactors. Care shall be taken that material close to the bank, as well as in all other portions of the trench, is thoroughly compacted to densities required.
4. Class B backfill shall be placed from the top of the select backfill to the specified material at grade (loam, pavement subbase, etc.). Fill compaction shall meet the density requirements of this specification.
5. Water Jetting:
  - a. Water jetting may be used when the backfill material contains less than 10 percent passing the number 200 sieve, but shall be used only if approved by the Engineer.
  - b. Contractor shall submit a detailed plan describing the procedures he intends to use for water jetting to the Engineer for approval prior to any water jetting taking place.

- c. Compaction of backfill placed by water jetting shall conform to the requirements of this specification.
- 6. If the materials above the trench bottom are unsuitable for backfill, the Contractor shall furnish and place backfill materials meeting the requirements for trench backfill, as shown on the drawings or specified herein.
- 7. Should the Engineer order crushed stone for utility supports or for other purposes, the Contractor shall furnish and install the crushed stone as directed.
- 8. In shoulders of streets and road, the top 12-inch layer of trench backfill shall consist of processed gravel for sub-base, satisfying the requirements listed in MassDOT standard specification M1.03.1.

C. BACKFILLING UNDER BUILDINGS AND FOUNDATIONS:

Material to be used as structural fill under structures shall be special bedding material or gravel borrow, as shown on the Drawings or as required by the Engineer. Where gravel borrow fill is required to support proposed footings, walls, slabs, and other structures, the material shall be placed in a manner accepted by the Engineer. Compaction of each lift shall meet the density requirements of this specification.

D. BACKFILLING ADJACENT TO STRUCTURES:

- 1. The Contractor shall not place backfill against or on structures until they have attained sufficient strength to support the loads to which they will be subjected. Excavated material approved by the Engineer may be used in backfilling around structures. Backfill material shall be thoroughly compacted to meet the requirements of this specification.
- 2. Contractor shall use extra care when compacting adjacent to pipes and drainage structures. Backfill and compaction shall proceed along sides of drainage structures so that the difference in top of fill level on any side of the structure shall not exceed two feet (2') at any stage of construction.
- 3. Where backfill is to be placed on only one side of a structural wall, only hand-operated roller or plate compactors shall be used within a lateral distance of five feet (5') of the wall for walls less than fifteen feet (15') high and within ten feet (10') of the wall for walls more than fifteen feet (15') high.

3.04 DISPOSAL OF SURPLUS MATERIALS:

- A. Surplus excavated materials, which are acceptable to the Engineer, shall be used to backfill normal excavations in rock or to replace other materials unacceptable for use as backfill. Upon written approval of the Engineer, surplus excavated materials shall be neatly deposited and graded so as to make or widen fills, flatten side slopes, or fill

depressions; or shall be neatly deposited for other purposes as indicated by the Owner, within its jurisdictional limits; all at no additional cost to the Owner.

- B. Surplus excavated material not needed as specified above shall be hauled away and disposed of by the Contractor at no additional cost to the Owner, at appropriate locations, and in accordance with arrangements made by him. Disposal of all rubble shall be in accordance with all applicable local, state and federal regulations.
- C. No excavated material shall be removed from the site of the work or disposed of by the Contractor unless approved by the Engineer.
- D. The Contractor shall comply with Massachusetts regulations (310 CMR 40.0032) that govern the removal and disposal of surplus excavated materials. Materials, including contaminated soils, having concentrations of oil or hazardous materials less than an otherwise Reportable Concentration and that are not a hazardous waste, may not be disposed of at locations where concentrations of oil and/or hazardous material at the receiving site are significantly lower than the levels of those oil and /or hazardous materials present in the soil being disposed or reused.

END OF SECTION

## SECTION 31 11 00

### SITE CLEARING

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS:

- A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

##### 1.02 SUMMARY:

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to prepare the site, complete, as indicated on the Contract Documents, as specified, and as follows:
  - 1. Clearing and grubbing of existing vegetation
  - 2. Tree protection

##### 1.03 RELATED SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
  - 1. Division 02 Section – SITE PREPARATION AND DEMOLITION
  - 2. Division 32 Section – TREE PRUNING & REMOVAL

#### PART 2 – PRODUCTS

##### 2.01 TREE PROTECTION FENCE

- A. Tree protection fencing shall be one of the following, at the Contractor's option.
  - 1. Galvanized chain link fencing: Posts for fencing shall be nominal 2-1/2 inches diameter, galvanized steel posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 10 feet on center maximum. Fence fabric shall be 2-inch mesh, 11-gauge minimum.
  - 2. Wire bound woodroll snow fence with 3/8-inch x 1-1/2-inch wide pickets, spaced approximately 2 inches apart bound together with at least 13-gauge

- galvanized steel wire and with brightly painted top edge. Stakes for fencing shall be steel or wood posts. Posts shall be spaced 10 feet maximum.
3. Polypropylene barricade fencing manufactured by Ben Meadows Co., 3589 Broad Street, Atlanta, GA 30366. Stakes for fencing shall be 2-inch x 4-inch wood posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 8 feet maximum.
  4. Plastic polymer safety fence, Model BX2050 Safety Grid, manufactured by The Tensar Corporation, Morrow, GA 30260, or approved equal. Color shall be high visibility orange. Stakes for fencing shall be 2-inches x 4-inches wood posts, driven a minimum of 3 feet into the ground. Posts shall be spaced 8 feet on center maximum.
  5. Unless otherwise indicated, height of fencing shall be 4 feet.

### PART 3 – EXECUTION

#### 3.01 CLEARING

- A. Trees, shrubs, stumps, brush, grasses, turf, herbaceous plants, downed timber, rubbish, organic matter, miscellaneous vegetation or extraneous debris not indicated on the Contract Documents or designated in the field by the Landscape Architect to remain shall be cleared.
- B. Clearing shall include the felling, cutting, and satisfactory disposal of all trees, stumps and vegetative debris produced through the clearing operations.
- C. Fell trees in such a way as to not injure trees to be saved. Excavation or grading within the branch spread of trees to be saved shall be performed only under the direction of the Landscape Architect unless otherwise directed.
- D. Clearing includes felling of individual trees and removal of areas of other vegetation.
- E. Stumps shall be removed to their full depth. Roots 3 inches and larger shall be removed to a depth of 1-foot below finished grade. Stumps shall be legally disposed of off-site.

#### 3.02 PROTECTION OF EXISTING TREES

- A. The Contractor shall make every effort not to damage existing plant materials to remain. The Contractor is required to install protection as necessary to assure undamaged plant material and adjacent conditions.
- B. Trees designated to remain (all that are not noted to be removed on Contract Drawings) shall be protected by the placement of a tree protection fence. The Contractor shall provide tree protection enclosure fence at the drip line of trees noted on Contract Drawings. All other trees noted to be protected shall have fence protecting the trunks from damage.

- C. Place tree protection additionally at all other locations where trees and/or shrubs may be jeopardized by construction activities. Tree protection fencing shall be supported with specified stakes at maximum 5 ft. on center intervals.
- D. Tree protection shall remain in place and be maintained in working condition by the Contractor until directed for removal by the Landscape Architect. All tree protection devices shall be removed from the site by the Contractor at the completion of the work.
- F. Vehicles shall not be parked within the dripline or where damage may result to trees to be saved. No construction materials shall be stored beneath trees to be saved.
- G. Site protection fencing shall include installation and maintenance. Installation shall be suitable to withstand the duration of the project. The Contractor shall be responsible for maintaining the site protection fence in good order and if necessary, must make any adjustments immediately to ensure site safety. The Contractor shall be responsible for maintaining a clean work site including debris, trash and vegetative material removal along the temporary fence line throughout the duration of the project.

### 3.03 TREE PRUNING & REMOVAL

- A. Pruning shall be specified, performed and paid for under the work of the Division 32 Section, TREE PRUNING & REMOVAL, of this Specification.
- B. Tree removal shall be specified, performed and paid for under the work of the Division 32 Section, TREE PRUNING & REMOVAL, of this Specification.
- C. Trees and plants designated to be saved shall be protected during pruning operations and all subsequent construction. The Contractor shall provide the handwork necessary to complete pruning operations without damage to adjacent trees as specified, performed and paid for under the work of the Division 32 Section, TREE PRUNING & REMOVAL, of this Specification. The Contractor shall provide the means necessary to prevent scrapes and scars to trunks and branches, and such damage shall require the Contractor to be assessed as previously specified above, or to replace damaged material to the satisfaction of the Landscape Architect.

END OF SECTION



## SECTION 32 01 90

### TREE PRUNING & REMOVAL

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

##### 1.02 SUMMARY

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform selective pruning and related trenching within the limits indicated on the Contract Documents and as specified herein. Work shall include, but not be limited to, the following:
  - 1. Root pruning
  - 2. Crown thinning
  - 3. Tree removal

##### 1.03 REFERENCES

- A. The following standards shall apply to the work of this Section.
  - 1. American National Standards Institute (ANSI):
    - A300 Tree Care Operations; Tree, Shrub, and Other Woody Plant Maintenance, Standard Practices:
      - a. Part 1, Pruning
      - b. Part 2, Fertilization
      - c. Part 3, Support Systems a. Cabling, Bracing, and Guying
    - Z133.1 Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush
  - 2. National Arborist Association, 3537 Stratford Rd., Wantagh, NY 11793 (NAA):
    - Ref. 1 Pruning Standards for Shade Trees
    - Ref. 2 Standard for Fertilizing Shade and Ornamental Trees
  - 3. Massachusetts Food and Agriculture Department (MA):
    - Ref. 1 Control Recommendation Guide for Insect, Disease, and Weed Pests of Shade Trees and Woody Ornamentals

##### 1.04 RELATED SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:

- 1. Division 02 Section – SITE PREPARATION AND DEMOLITION
- 2. Division 31 Section – SITE CLEARING

#### 1.05 SUBMITTALS

- A. At least 90 days prior to the start of construction activities, submit to the Landscape Architect name of professional Certified Arborist hired to perform the work of this Section and proof of arborist's certification.

#### 1.06 QUALITY ASSURANCE

- A. Selective pruning methods shall conform to the applicable requirements of ANSI Z133.1.
- B. Work of this Section shall be completed by a professional Certified Arborist with a minimum five years experience, who has successfully completed a certification program equal to the Massachusetts Certified Arborist (MCA) program/examination sponsored by the Massachusetts Arborists Association, Natick, MA.

#### 1.07 COORDINATION

- A. Notify E before work that requires inspection or testing or both.
- B. Do not perform hand trenching and/or tunneling work until required root and crown pruning is complete and Landscape Architect is present for inspection.

#### 1.08 WARRANTY

- A. Damage and Destruction of Trees shall be in accordance with the requirements of Division 31 Section - TREE AND PLANT PROTECTION of this Specification.

### PART 2 – PRODUCTS

NOT USED

### PART 3 – EXECUTION

#### 3.01 PREPARATION

- A. The Contractor shall be responsible for the protection of all existing trees and plants designated to remain for the length of the construction period, including liability for all damages as specified in this Section.

### 3.02 TREE PRUNING

- A. Trees designated to be pruned during construction shall be pruned by an approved Arborist at the direction of the Landscape Architect.
- B. Any accidental injuries to the bark, trunk or branches of any tree shall be repaired immediately as directed by the Landscape Architect.
  - 1. All pruning must be done in compliance with American National Standards Institute Z133 and A300 standards.
  - 2. Prior to the start of work all trees to be pruned shall be inspected by an Arborist certified by the International Society of Arboriculture. Proof of certification is required prior to granting of contract. Any unusual safety or tree health concerns must be recorded and presented to the Landscape Architect.
  - 3. All pruning cuts shall be made according to ANSI A300 section 5.2.5. No stubs shall be left nor shall flush cuts be made, the branch collar shall be left intact. Severed limbs shall be removed before the end of the workday. Wound dressing shall not be applied.
  - 4. Tree branches shall be removed in a manner that does not damage the tree, other plants or property. Where necessary, ropes shall be used to lower large branches. Not more than 1/4 of the leaf surface of a tree shall be removed. Upon completion of pruning, one half or the foliage shall remain evenly distributed in the lower two thirds of the tree crown and on individual limbs.
  - 5. The following classes of pruning shall be used as designated on the Drawings:
    - a. Crown cleaning: Trees designated for crown cleaning shall have dead, dying, diseased and/or weak branches one inch in diameter and larger removed. Not more than one out of 4 water sprouts shall be removed when present. One stem of weakly attached "V-crotches" less than 4 inches in diameter shall be removed. The presence of larger V-crotches shall be noted and provided to the Landscape Architect.
    - b. Crown thinning: Trees designated for crown thinning shall have all branches specified in crown cleaning removed and in addition shall have 10 to 15 percent of the live branches removed, mainly from the outer crown of the tree. Preference shall be given to the removal of branches outside the normal shape of the tree crown. The majority of the live branches to be removed shall be between 1/4 and 1 inch in diameter.
    - c. Crown raising: Trees may be designated for crown raising as well as one of the two other types of pruning. Crown raising shall consist of removal of lower limbs at the trunk or the removal of smaller branches that will allow the upward movement of a lower limb to provide 8 feet of clearance.
  - 6. All appropriate safety regulations must be followed. A ground person must be situated to direct pedestrian traffic and to maintain a safe work site.

### 3.03 TREE REMOVAL

- A. Trees designated for removal on the plans shall be removed from the site. This work shall include the felling of the trees in such a way as to not injure trees to be saved, utility lines and poles, houses, garages, lawns, plantings and pavement. Tree removal also shall include the satisfactory disposal of all tree trunks, branches, stumps and vegetative debris produced through the tree removal operation.
- B. Prior to the commencement of tree removal operations the Contractor shall review with the Landscape Architect which trees shall be removed. Under no circumstances shall the tree removal operation commence without the written concurrence of the Landscape Architect.

#### 3.04 PUBLIC HEALTH AND SAFETY

- A. Upon encountering any condition of tree work or tree health which might threaten the public health, safety or welfare and which is not directly addressed by this Section the certified arborist and the Contractor shall notify the Landscape Architect immediately and shall make recommendations pertaining to the resolution of said conditions.

END OF SECTION

## SECTION 32 90 00

### PLANTING

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

##### 1.02 SUMMARY

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all planting work and related items as indicated on the Contract Documents and as specified in this Section and includes, but is not limited to, the following:
  - 1. Planting trees, perennials, bulbs
  - 3. Planting maintenance
  - 4. One-year guarantee period for all plants
  - 5. Providing and placing backfill mix

##### 1.03 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
  - 1. Division 32 Section - PLANTING SOILS

##### 1.04 REFERENCES

- A. The following standards shall apply to the work of this Section.
  - 1. Hortus III, 1976, L. H. Bailey Hortorium
  - 2. Tree and Shrub Transplanting Manual, E.B. Himelick, 1991, International Society of Arboriculture
  - 3. American National Standards Institute (ANSI):
    - Z60.1 American Standard for Nursery Stock, latest edition, published by American Nursery & Landscape Association, (ANLA)

## 1.05 SUBMITTALS

- A. Submit proof of landscape contractor's experience to the Landscape Architect in accordance with QUALITY ASSURANCE paragraph of this Section, PLANTING.
- B. At least 30 days prior to ordering materials, the Contractor shall submit to the Landscape Architect representative samples, certifications, manufacturer's product data and certified test results for materials as specified below. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Landscape Architect. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Landscape Architect reserves the right to reject, on or after delivery, any material which does not meet these Specifications.
- C. Material Sampling and Testing:
  - 1. Material Sampling and Testing of Loam Borrow from Off-Site Sources shall be specified, performed and paid for under the work of the Section, PLANTING SOILS, of this Specification. Testing of the off-site loam borrow shall occur in place after the loam has been spread and represents a second testing of the off-site loam borrow. The first sampling and testing shall have occurred prior to delivery of the loam as specified, performed and paid for under the work of the Section, PLANTING SOILS, of this Specification. Additional sampling and testing of delivered and stockpiled loam or delivered and spread loam to verify that it meets the test results submitted for approval under the Section, PLANTING SOILS, shall not be abrogated by the language of this Section, PLANTING.
  - 2. Material Sampling and Testing of On-Site Loam: On-site loam shall be sampled and tested as specified, performed and paid for under the Section, PLANTING SOILS, of this Specification.
  - 3. Planting Mulch: Submit a one cubic foot sample.
  - 4. Anti-desiccant: Submit manufacturer's product data.
  - 5. Peat: Submit a one cubic foot sample and manufacturer's certification of contents.
  - 6. Tree Staking System: Submit manufacturer's product data of system.
  - 7. Soil Additives: Submit manufacturer's product data for all soil additives needed to amend a specific soil in order to meet the requirements of this Section, PLANTING.

## 1.06 EXAMINATION OF CONDITIONS

- A. All areas to be planted shall be inspected by the Contractor before starting work and any defects such as incorrect grading or inadequate drainage shall be reported to the Landscape Architect prior to beginning this work.

- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved, including but not limited to the potential need for storing and maintaining plants temporarily and/or re-handling plants prior to final installation.
- C. All plants are the full responsibility of the Contractor between the time of digging at the nursery and final acceptance.

#### 1.07 QUALITY ASSURANCE

- A. Qualification of Landscape Contractor: The work of this Section, PLANTING, shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years' experience. Proof of this experience shall be submitted per SUBMITTALS paragraph of this Section, PLANTING.

### PART 2 – PRODUCTS

#### 2.01 LOAM BORROW

- A. Loam borrow for planting shall be specified, provided, installed and paid for under the work of the Section, PLANTING SOILS, of this Specification.

#### 2.02 SOIL ADDITIVES

- A. Soil additives shall be specified, provided, installed and paid for under Section, PLANTING SOILS, of this Specification.

#### 2.03 GRADES AND STANDARDS OF PLANTS

- A. The Contractor shall furnish all plants shown on the Contract Documents, as specified, and in quantities listed on the PLANT SCHEDULE. No substitutions will be permitted, without written approval by the Landscape Architect. All plants shall be nursery grown unless specifically authorized to be collected as noted on the PLANT SCHEDULE.
- B. All plants shall be typical of their species or variety and shall have a normal habit of growth and be legibly tagged with the proper name. Only plant stock grown within Hardiness Zones 1 through 6b, as established by the USDA Plant Hardiness Zone Map, latest edition, will be accepted.
- C. Plants shall be in accordance with ASNS Standards of the American Nursery & Landscape Association except as noted in this Section, PLANTING. Botanical plant names shall be in accordance with plant designations included in Hortus III.

D. If, at any time during the performance of the Contract, any plant shows signs of graft incompatibility, as determined by the Landscape Architect, then the tree or shrub and all other similarly grafted plants of the same Genus/Species/Variety shall be rejected and removed from the site. Visual symptoms of graft incompatibility as cause for rejection include:

1. Development of over-growths by rootstock or scion resulting in the development of shoulders or inverted shoulders.
2. Suckering of the rootstock combined with poor growth or dieback of scion.
3. Any mechanical weakness between scion and rootstock.
4. Any marked difference in bark pattern and structure between scion and rootstock.

E. All deciduous trees shall meet the following standards:

1. Trees shall have a single, straight trunk, well formed, and sturdy. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety.
2. Trees with multiple leaders shall conform to all standards noted in this Section, PLANTING for single leader trees and shall be accepted only as noted on the PLANT SCHEDULE.
3. All pruning wounds shall show vigorous bark on all edges at the time of harvest. Trees shall be free from all signs of pest and disease damage. The trunk shall be free from sun scald, frost cracks, and wounds resulting from abrasions, fire, animal damage, or other causes.
4. Pruning scars within the crown of any tree shall be clean cut and shall leave no protrusion beyond the branch collar.
5. All trees shall have healthy, vigorous leaves or needles of normal size, color, shape, and texture for the particular species and variety.
6. Deciduous shade trees and deciduous flowering trees shall have fall color typical for their species and variety.
7. Unless otherwise indicated on the PLANT SCHEDULE, the height and spread of deciduous shade trees shall be the minimum requirements.
8. Take caliper measurements for deciduous trees 6 inches above ground level up to and including 4 inches caliper size and 12 inches above ground for larger sizes.
9. No deciduous tree shall be pruned after the Landscape Architect has tagged the plant in the nursery except as directed by the Landscape Architect.
10. Unless otherwise noted on the PLANT SCHEDULE, shade trees for use in paved areas shall have no branches lower than 6.5 feet from finish grade and no higher than 7.5 feet from finish grade. Flowering trees for use in areas away from pedestrian traffic shall have the first branch of their crowns no higher than 4 feet from finish grade.
11. Branching of all deciduous trees shall be best quality representatives of the species, cultivar or variety with lateral branching around the entire trunk to



form a symmetrical tree for 80 percent to 100 percent of the tree's outer perimeter. All branches on deciduous trees shall meet the trunk at angles no less than 30 degrees and no greater than 90 degrees from the vertical.

## 2.04 ROOT SYSTEMS FOR ALL PLANTS

- A. Each plant shall have an extensive, symmetrically balanced fibrous root system. Any root ball which shows signs of asymmetry, girdling, injury, or damage to the root system shall be rejected.
- B. Curling or spiraling of the roots along the walls of rigid containers will not be accepted. Curling, spiraling or girdling roots within balled and burlapped material will not be accepted.
- C. All parts of the fibrous root system of all plants shall be moist and fresh with a white color when washed of soil. When the plant is removed from the container, the visible root mass shall be healthy with white root tips. The root systems of all plants shall be free of disease, insect pests, eggs, or larvae.
- D. All trees which are not grown in containers must be moved with the root systems as solid units with balls of earth firmly wrapped with untreated 8 ounce natural, biodegradable fabric burlap, firmly laced with stout, natural biodegradable cord or twine. The base of the tree trunks shall be wrapped with a protective burlap layer, surrounded by a cardboard trunk protector, and loosely tied with twine.
- E. The diameter and depth of the balls of earth must encompass the fibrous and root feeding system necessary for the healthy recovery of the plant. Minimum root ball diameters and depths shall be in accordance with ASNS standards.
- F. No plants shall be loose in the container.
- G. Container grown plants which have roots growing out of the container will be rejected.

## 2.05 PLANTING SOIL MIX

- A. Planting soil mix shall be an approved loam borrow specified, provided, installed and paid for under the Section, PLANTING SOILS, of this Specification and that has been pH adjusted according to particular planting applications and improved through the addition of organic matter as directed below. Planting loam shall conform to the following pH levels:
  - 1. Planting soil mix for general planting of non-acid loving plants shall have a true pH value of 6.0 to 6.5. Planting soil mix shall be amended by the Contractor at his own expense to the proper pH range by mixing with dolomitic

limestone as specified, provided, installed and paid for under the Section, PLANTING SOILS, of this Specification.

2. The amount of either sulfur or limestone required to adjust the planting soil mix to the proper pH range shall be approved by the Landscape Architect on the basis of soil tests as specified, provided, installed and paid for under the Section, PLANTING SOILS, of this Specification.
3. In those areas indicated on the Contract Documents, augment planting soil mix with 10 percent gypsum. Thoroughly premix gypsum into planting soil mix prior to commencing the planting operations. Gypsum shall be specified, provided, installed and paid for under the Section, PLANTING SOILS, of this Specification.

## 2.06 MULCH

- A. Bark Mulch: Mulch shall be high quality, double-ground, premium bark mulch of 70 percent hemlock bark with the balance spruce and pine bark. Mulch shall have been aged for a minimum of six months and not longer than two years. Bark mulch shall be shredded to a uniform size; free of dirt, debris and foreign matter; with pieces no thicker than one-quarter inch. Mulch must be free of stringy material or chunks over 3 inches in size and shall not contain, in the judgment of the Owner's Representative, an excess of fine particles. Submit sample for the Owner's Representative's approval.

## 2.07 WATER

- A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, the Owner shall furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owner's water supply is not available or not functioning, the Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.
- B. Watering bags shall be installed around each deciduous tree. Watering bags shall be capable of releasing 20 gallons of water over a 24 hour period.
  1. Contractor shall remove the water bags at Final Completion or remain for future removal at the Owner's discretion.

## 2.08 ANTI-DESICCANTS

- A. Anti-desiccants shall be emulsions or other materials which will provide a protective film over plant surfaces permeable enough to permit transpiration and specifically manufactured for that purpose. Manufacturer of anti-desiccant shall be subject to the Landscape Architect's approval and shall be used only after approval by the Landscape

Architect. Anti-desiccant shall be delivered in containers of the manufacturer and shall be mixed and applied according to the manufacturer's instructions.

### PART 3 – EXECUTION

#### 3.01 PLANTING

- A. Furnishing and planting of plant material shall include, but shall not be limited to, the digging of planting pits and plant beds, amendment of loam as required to produce planting soil mix, provision of soil additives required to adjust for pH requirements of specific plants, furnishing the plants as specified as well as the labor of planting, fertilizing, and maintenance.
- B. Prior to spreading of loam, subgrades shall have been tested to determine if they are too compact to drain water as specified, performed and paid for under the work of Section, PLANTING SOILS, of this Specification.
- C. The Contractor shall locate plant material sources and ensure that plants are shipped in timely fashion for installation.
- D. Contractor shall locate all existing underground utilities that are within 10 feet (3 meters) of the proposed planting pits and notify the Landscape Architect of any conflicts prior to digging plant pits.
- E. Seasons for Planting:
  - 1. Spring: Deciduous materials – March 21 through May 1
  - 2. Fall: Deciduous materials – October 1 through December 1
- F. Plant Material Inspection:
  - 1. At a minimum of 21 days after the Notice to Proceed, the Contractor shall identify the supplying nursery or nurseries for approval. At least one month prior to the expected planting date, the Contractor shall request that the Landscape Architect provide a representative to select and tag stock to be planted under this Section, PLANTING. The Contractor shall pay for the transportation, subsistence and overnight accommodations, if necessary, for the Landscape Architect's representative during the period of time required to select and tag the plant material.
  - 2. The Contractor shall be responsible to certify the availability of quality plants in specified sizes from his/her sources of supply prior to requesting that the Landscape Architect make plant source inspections. In the event that plants at the inspection location are found to be unavailable or of insufficient size, the Contractor shall be liable to reimburse the Owner for all costs of the Landscape

Architect's hourly services which are incurred during unproductive inspection trips.

3. Unless specifically designated otherwise, a representative of the Contractor shall accompany the Landscape Architect on all plant material selection field trips.
4. All trees for the project shall be individually tagged for approval with the Landscape Architect's seals, and no trees shall be accepted for delivery to the site without such seals.
5. Plants to be inspected shall be in locations and conditions that allow direct and un-obscured inspection by the Landscape Architect. Harvested trees held in storage shall not have branches tied up. Harvested trees shall not have trunks obscured by burlap, cardboard trunk protection, or other devices that would otherwise obscure inspection. In the event that branches are tied up, trunks are obscured by burlap or cardboard trunk protection, or root flares hidden by burlap and twine and the Landscape Architect cannot inspect root flares, trunks or branching habit, the Contractor shall bear all responsibility and costs associated with tree rejection at a later date during the course of the Contract.
6. Inspection and approval of plants at the source shall not impair the right of subsequent inspection and rejection upon delivery to the site, or during the progress of the work if the Landscape Architect finds that plants do not meet the requirements of the PLANT SCHEDULE or this Contract, have declined noticeably due to handling abuse, lack of maintenance, or other causes. Cost of replacements, as required, shall be borne by the Contractor.

G. Placement of Loam for planting soil shall be specified, performed and paid for under the work of Section, PLANTING SOILS, of this Specification. Obtain Landscape Architects written approval of work of rough grading and finish grading prior to starting the work of planting.

H. Planting:

1. Notify the Landscape Architect three working days prior to the proposed arrival of plant material on the site. If not planted within 24 hours of delivery to the site, all plants shall be maintained in an on-site nursery. Container grown shrubs stored on site shall be shaded from direct sunlight at all times and shall not be stored directly on paved surfaces. All plants delivered to the site and not planted within 24 hours of delivery shall have their root balls covered with mulch and shall be watered on a daily basis such that root balls are kept moist throughout.
2. Locations for all plants and outlines for planting areas shall be staked on the ground by the Contractor for approval by the Landscape Architect before any plant pits or plant beds are dug. Notify the Landscape Architect no less than 3 days prior to desired date of inspection of staking to schedule site visit.

3. Circular plant pits shall not be required provided that the minimum dimension between the edge of the pit and the face of the rootball is not less than required by this Section, PLANTING.
4. All plant pits dug with a machine shall have the sides of the holes scraped with hand shovels to prevent glazing or compaction of the sides of the hole. Remove and stockpile excavated loam for reuse as backfill for plant pit. All subsoil excavated from the bottoms of planting pits shall be removed from the site.
5. Plant pits shall be dug to the dimensions shown on the Contract Documents.
  - a. Plant pits for trees shall be a minimum three times greater in diameter than the diameter of the root ball. Place root ball directly on subgrade. Slope sides of tree pits at a 45 degree angle.
  - b. Plant pits for trees and shrubs shall be dug to the depth of the rootball to be planted.
  - c. Remove all soil from around the root flare of the stem of the plant and from the top of the rootball to determine the true depth of the rootball. All plants that have been planted and have root flares that are buried will be rejected.
6. All plant roots and earth balls must be damp and thoroughly protected from sun and wind from the beginning of the digging operation, during transportation, and at the site until the final planting.
7. Remove container plants from containers prior to planting.
8. Trees shall be placed in the center of plant pits, plumb, with the crown of their roots exposed and located above the surrounding finish grade.
9. Prior to completion of planting installations, remove rope and cut wire baskets from the top 1/3 of the root balls. Pull burlap away from the trunk or stem of the plant and cut burlap from the top 1/3 of the root balls.
10. Planting soil shall be backfilled with approved planting soil to the full depth of the planting pit or bed. Eliminate air pockets and compact the soil by flooding the tree pit or plant bed within 2 hours of planting installation. After water has drained from the planting pit or bed and planting backfill has dried enough additional planting soil shall be spread in pit or bed to bring the finished surface of the planting pit or bed to grades shown on the Contract Documents. A saucer shall be formed around each plant at a depth of 3 inches (75 mm) for trees.
11. Fertilizer shall be spread over the plant saucer or plant bed between the saucer and the edge of the rootball. Till the fertilizer into the soil to a depth of four inches prior to the placement of the planting mulch. Fertilizer shall be provided, spread and paid for under the Section, PLANTING SOILS, of this Specification. Do not mulch until placement of the fertilizer has been verified by the Landscape Architect. Fertilizer application rates shall be as determined by soil testing, analysis, and testing laboratory recommendations specified, performed and paid for under the Section, PLANTING SOILS, of this Specification.

I. All plants shall be watered immediately following planting as necessary to thoroughly moisten rootball and plant pit loam and thereafter shall be inspected frequently for watering needs and watered, as required, to provide adequate moisture in the planting pit. The Contractor shall inspect tree pits 24 hours after initial watering to confirm that they are draining properly. If surface water or excessively saturated plant pit soils exist, the Contractor shall immediately notify the Landscape Architect. The Landscape Architect will recommend remedial measures based upon site conditions.

J. Keeping Trees Plumb:

1. Contractor shall keep trees plumb and upright at all times.

K. Mulch material shall be placed over entire saucer areas of individual trees and shrubs and over the entire area of planting beds to a depth of 3 inches (75 mm) after settlement, not later than one week after planting. Do not apply mulch prior to the first watering of plant materials. Do not apply mulch prior to placement of surface applied fertilizer and verification of placement by the Landscape Architect.

L. The trunks of all deciduous trees over 1-1/2 inches (40 mm) in diameter shall be wrapped by the Contractor immediately after the inspection of the trees by the Landscape Architect. Wrapping shall extend from the ground line to the height of the second branches or to the height directed. The specified wrapping shall be wound spirally, starting from the base and overlapping 1-1/2 inches (40 mm) in order to shed water. Wrapping shall be securely taped to prevent loosening and unraveling. If trees are planted in springtime, do not apply any tree wrapping. If deciduous trees are planted in the autumn, wrap the trees and then remove wrapping the following spring.

1. Trees delivered to the site wrapped for protection shall be unwrapped at the site for inspection of the trunk by the Contractor and Landscape Architect.

M. Pruning:

1. As directed by the Landscape Architect, each plant shall be pruned in accordance with the workmanship requirements of "Pruning Standards" for Class I, fine pruning, to preserve the natural character of the plant.
2. Tree pruning, as required, shall be undertaken to the full height of affected trees.
3. All dead wood or suckers and all broken or badly bruised branches shall be removed. Never cut a leader.

N. If planting is done after lawn preparation or installation, proper protection of lawn areas shall be provided. Any damage resulting from planting operations shall be repaired immediately at no cost to the Owner. Repair work shall be as specified and installed under the work of Section, SEEDING, of this Specification and paid for under this Section, PLANTING.

- O. Absolutely no debris may be left on the site. Repair any damage to site as directed by the Landscape Architect, at no additional cost.

### 3.02 MAINTENANCE

- A. Maintenance shall begin immediately after each plant is planted and shall continue for a minimum 90-day Monitoring Period within the growing season and until Final Acceptance. The growing season is from April 1 to November 1.
- B. Maintenance shall consist of keeping the plants in a healthy growing condition and shall include but is not limited to watering, weeding, cultivating, pruning, re-mulching, tightening and repairing of guys, straightening of trees to a plumb position, removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer.
  - 1. Plants shall be inspected for watering needs at least twice each week and watered to promote plant growth and vitality. The following watering rates assume that the soil is free draining. If the on-site conditions do not ensure a free draining soil, then notify the Landscape Architect in writing of this condition. Watering rates in free draining soils are presented here as guidelines to ensure that the top six inches of plant bed soil remains moist at all times. Actual watering rates may vary depending upon soil conditions. Guideline rates shall be as follows:

<u>Type of Plant/Size</u>	<u>Weekly Watering Rate</u>
Deciduous Trees:	
1 - 1-1/2 in. caliper	40 gallons
1-1/2 - 2 in. caliper	54 gallons
2 - 2-1/2 in. caliper	61 gallons
2-1/2 - 3 in. caliper	70 gallons
3 - 3-1/2 in. caliper	80 gallons

- a. Water shall be applied by 1 inch diameter hose with an attached metering gauge.
- 2. For trees, apply water into the watering bag.
- 3. Stakes shall be kept plumb and neat in appearance. Guys, wires and anchoring cables shall be tightened and repaired weekly.
- 4. Individual plant pits shall be kept free of weeds, and mulch shall be replaced as required to maintain the specified layer of mulch. Individual pits shall be neat in appearance and maintained to the designed layout.
- 5. Plants that die during the maintenance period shall be removed and replaced by the Contractor within one week of notification and replaced during that growing season, unless directed otherwise by the Landscape Architect.

6. Spraying of insecticides or herbicides shall be done by State-licensed professionals. Spraying for insects, pests and diseases shall conform to the National Arborist Association Standards under the section entitled "Standards for Pesticide Application Operations", as currently adopted and as approved by the Landscape Architect. All insecticides, pesticides, and herbicides shall be EPA-approved and shall conform to the requirements of the State of Rhode Island.
  7. Work of pruning, fertilizing, spraying, and similar activities shall be undertaken only by Certified Arborists and licensed chemical applicators, as pertinent to the work being performed.
- C. During the maintenance period, any decline in the condition of plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturalists to inspect plant materials and to identify problems and recommend corrective procedures. The Landscape Architect shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Landscape Architect.
- D. Contractor is responsible for watering the entire park for the duration of construction.

### 3.03 ACCEPTANCE

- A. Upon completion of all planting work, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work.
- B. If plant materials and workmanship are acceptable, the Landscape Architect will issue a written Certificate of Conditional Acceptance to the Contractor.
- C. Following the issuance of the Certificate of Conditional Acceptance to the Contractor, the Contractor shall maintain the plants for a minimum 90 day Monitoring Period. At the end of the Monitoring Period, the plant material will be inspected by the Landscape Architect to determine whether or not all planting work has been performed to the requirements of this Section, PLANTING.
- D. Acceptance Standards at end of the Monitoring Period: If plant material is reviewed when it is in full leaf, leaves shall be plump with water with a shape indicative of the species and shall be free of insect, pest and disease damage. Twigs shall have living cambium for their full length. Twigs and branches shall have a full bud set for their full length, including terminal buds. Trunks and branches shall be free of frost cracks; sun scald; damage due to insects, pests, and disease; structural defects; and damage resulting from machinery or tools. Plant material inspected and reviewed when the plants are not in full leaf shall have twigs, branches and trunks meeting the above requirements. All plants regardless of the season of review shall have a minimum of 75



percent healthy, balanced branching structure with a healthy terminal leader(s) with viable terminal bud(s).

- E. If any number of plants do not meet these Acceptance Standards at the time of inspection, or if in the Landscape Architect's opinion, workmanship is unacceptable, written notice will be given by the Landscape Architect to the Contractor in the form of a punch list, which itemizes necessary planting replacements and/or other deficiencies to be remedied. The Contractor's responsibility for maintenance of all plants shall be extended until replacements are made or other deficiencies are corrected. All plants that do not meet these Acceptance Standards shall be removed from the project within seven days of receipt of the punch list. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner
- F. Following the correction of all Punch List deficiencies, the Contractor shall request in writing that the Landscape Architect formally inspect the planting work. If plant materials and workmanship are acceptable, the Landscape Architect will issue a written Certificate of Final Acceptance to the Contractor.

#### 3.04 GUARANTEE

- A. The date of the Certificate of Final Acceptance shall establish the commencement of the required one-year guarantee and establishment period for planting work.
- B. During the guarantee period, Contractor shall replace dead/damaged plants at their expense.
- C. At the end of the guarantee and establishment period, a final inspection will be held to determine whether any plant material replacements are required. Each plant shall be plumb, shall have a character that is natural for its species as determined by the Landscape Architect, and shall conform to the Acceptance Standards described in this Section, PLANTING. Plants found to be unacceptable shall be removed promptly from the site and replaced according to this Section, PLANTING. A final inspection will be made after the replacement plants have lived through one year.
- D. At the end of the one-year guarantee and establishment period, remove all tree stakes, guys, or anchors installed on trees during the course of the work of this contract.
- E. All replacements shall be plants of the same kind and size specified in the PLANT SCHEDULE. The cost shall be borne by the Contractor, except for possible replacements due to vandalism or neglect on the part of others.

END OF SECTION 32 90 00  
PLANTING

## SECTION 32 91 13

### PLANTING SOILS

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

##### 1.02 SUMMARY

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to supply and place planting soils as indicated on the Contract Documents and as specified. Supplying and placement of planting soils shall include, but not be limited to:
  - 1. Sampling and testing of loam borrow.
  - 2. Modifying, screening, placing, spreading and grading of loam borrow.
  - 3. Providing all other sampling, testing, supplying, placing, spreading and grading of planting soils as required by this Section.

##### 1.03 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
  - 1. Division 31 Section - EARTH MOVING
  - 2. Division 32 Section - PLANTING

##### 1.04 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - D 75 Practice for Sampling Aggregates
  - D 422 Test Method for Particle-Size Analysis of Soils
  - D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>)
  - D1557 Moisture-Density Relations of Soils and Soil-Aggregate Mixtures using 10-lb Rammer and 18-in. Drop
- B. A.O.A.C.: Association of Official Agricultural Chemists.

## 1.05 SUBMITTALS

- A. At least 30 days prior to ordering materials, the Contractor shall submit to the Landscape Architect representative samples, certifications, manufacturer's product data and certified test results for materials as specified below for approval in conformance with the requirements of Section, SUBMITTALS, of this Specification. No materials shall be ordered or delivered until the required submittals have been reviewed and approved by the Landscape Architect. Delivered materials shall closely match the approved samples. Approval shall not constitute final acceptance. The Landscape Architect reserves the right to reject, on or after delivery, any material that does not meet these Specifications.
1. Loam Borrow: The Contractor shall provide a one cubic foot representative sample for testing. All stockpile sampling shall be per ASTM D 75 and Appendixes for securing samples from stockpiles.

Testing will be at the Contractor's expense. Contractor shall deliver all samples to testing laboratories via overnight courier and shall have the testing report sent directly to the Landscape Architect. Perform all tests for gradation, organic content, soil chemistry and pH by UMASS Soil and Plant Tissue Laboratory, West Experiment Station, North Pleasant Street, University of Massachusetts, Amherst, MA 01003, (413) 545-2311.

Testing reports shall be dated within 30 days of submission to the Landscape Architect. Testing reports beyond 30 days old will be rejected and new testing reports mandated.

Testing reports shall include the following tests and recommendations. Contractor shall deliver samples to testing laboratories and shall have the testing report sent directly to the Landscape Architect from the Soil and plant Tissue Laboratory. Testing reports shall include the following tests and recommendations.

- a. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by  $H_2O_2$ . To facilitate review and approval of sieve analysis, provide a computer generated gradation curve from UMASS Soil & Plant Tissue Laboratory.
- b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test samples minus #10 material shall be oven-dried to a constant weight at a temperature of 450 degrees Fahrenheit (752 degrees Centigrade).
- c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, extractable Aluminum, Lead, Zinc, Cadmium, Copper, Soluble Salts, and pH and buffer pH. A Conductivity Meter shall be used to measure Soluble Salts in

- 1:2 soil/water (v/v). Except where otherwise noted, nutrient tests shall be for available nutrients.
- d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish lawn and planting work as specified.
- 2. Peat Moss: Submit a one cubic foot sample and supplier's certification of contents.
  - 3. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.
  - 4. Acidulant: Submit supplier's certification that the acidulant being supplied conforms to these Specifications.
  - 5. Fertilizer:
    - a. Submit product data of planting fertilizer and certificates showing composition and analysis. Submit fertilization rates for fertilizer product based upon soil testing, analysis, and recommendations as specified, performed and paid for under in this Section, PLANTING SOILS.
    - b. Submit the purchasing receipt showing the total quantity purchased for the project prior to installation.
  - 6. Gypsum: Submit manufacturer's product data and 2 pound sample.
  - 7. All additives needed to amend a specific soil in order to meet these specifications.

#### 1.06 EXAMINATION OF CONDITIONS

- A. All areas of the existing site where topsoil is to be sampled for testing shall be inspected by the Contractor before starting work and any issues that might inhibit or prevent the sampling operation shall be reported to the Landscape Architect prior to beginning this work.
- B. The Contractor and any sub-Contractor responsible for the execution of the Work of this Section, PLANTING SOILS, shall review and confirm in writing that the subsoil elevations have been brought to the proper subgrade elevations prior to proceeding with the spreading of the loam borrow.

### PART 2 – PRODUCTS

#### 2.01 LOAM

- A. Loam borrow shall be one of the following loamy sands and sandy loams; “loamy sand”, “loamy fine sand”, “loamy very fine sand”, or “coarse sandy loam”: determined by mechanical analysis (ASTM D 422) and based on the "USDA Classification System" and as defined in this Section. It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than 0.75 inches lumps, plants and their roots, debris and other extraneous matter as determined by the Landscape Architect.

Planting soil for lawn areas shall have the following grain size distribution for material passing the #10 sieve:

<u>Millimeter</u>	<u>Percent Passing by Weight</u>	
	<u>Maximum</u>	<u>Minimum</u>
2	-----	100
1	100	82
0.5	87	65
0.25	72	49
0.10	45	30
0.05	32	22
0.002	5	2

1. Maximum size shall be one and one quarter inches largest dimension. The maximum retained on the #10 sieve shall be 25% by weight of the total sample.
2. The ratio of the particle size for 80% passing (D<sub>80</sub>) to the particle size for 30% passing (D<sub>30</sub>) shall be 6.0 or less. ( $D_{80}/D_{30} < 6.0$ ).
3. In addition to the foregoing, all loam borrow to be used for loaming shall be mechanically screened processed loam borrow that passes a 3/4 inch by 6 inch (19 mm by 150 mm) screen size.

B. Organic content and pH for specific planting use shall be as follows:

1. Top 18 inches (450 mm) of areas planted with tree and shrub as described in the Section 32 90 00, PLANTING, of this Specification:
  - a. pH: 5.5 through 6.5 for non-acid loving plants
  - b. pH: 4.5 through 5.5 for *Ericaceae* and other acid-loving plants
  - c. Organic Content 4.0 - 6.0 percent as determined by the loss on ignition of oven-dried samples passing #10 sieve (Muffle furnace temperature: 450 +/- 10 degrees C for 8 hours)
2. Loam borrow shall be pH adjusted for particular planting applications and shall be adjusted prior to delivery to the Project sites as recommended by UMASS Soil & Plant Tissue Laboratory test results.
  - a. When pH of loam borrow is equal to or greater than 7 use aluminum sulfate to adjust pH downward to required levels.
  - b. When pH of loam borrow is less than 7 use either sulfur or ferrous sulfate to adjust pH downward to required levels.
  - c. When pH of loam borrow must be raised to the required levels use limestone.
  - d. Regardless of amendment Contractor chooses to use, Contractor, not the Owner, shall be responsible for obtaining specified pH by planting time.

C. All loam borrow proposed for use shall be tested for conformance to the specifications. Soil additives shall be used to counteract soil deficiencies as recommended by the soils analysis and as supplements for lawn construction as specified herein.

- D. The Landscape Architect reserves the right to reject on or after delivery to the project site any material which does not, in his opinion, meet these specifications.

### PART 3 – EXECUTION

#### 3.01 FILLING AND COMPACTION

- A. Subsoil or ordinary borrow shall have been excavated and filled as required by the Contract Documents and specified and paid for under the Section, EARTH MOVING, of this Specification. Do not damage the work previously installed. Maintain all required angles of repose of materials adjacent to the loam as shown on the Contract Documents. Do not over excavate compacted subgrades of adjacent pavement or structures during loaming operations.
- B. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Subgrade elevations shall slope parallel to the finished grade and or toward the subsurface drain lines as shown on the Contract Documents.
- C. Clear the subgrade of all construction debris, trash, rubble and any foreign material. In the event that fuels, oils, concrete washout or other material harmful to plants have been spilled into the subgrade material, excavate the soil sufficiently to remove the harmful material. Such construction debris, trash, rubble and foreign material shall be removed from the site and disposed of in a legal manner. Fill any over excavation with approved fill and compact to the required subgrade compaction levels.
- D. Do not proceed with the installation of loam borrow until all utility work in the area has been installed.
- E. Protect adjacent walls, walks and utilities from damage or staining by the loam borrow. Use 0.5-inch plywood and or plastic sheeting as directed to cover existing concrete, metal and masonry work and other items as directed during the progress of the work. Clean up all trash and any soil or dirt spilled on any paved surface at the end of each working day.

#### 3.2 FINE GRADING

- A. Place loam in two lifts. Place the first lift to a depth of 2 inches and harrow or till the loam into the underlying subsoil to a depth of 2 inches, creating a blended interface of loam and subsoil approximately 4 inches deep. Spread the second lift of loam to a minimum depth of 4 inches or greater as shown on the Contract Documents.
- B. No loam borrow shall be handled, planted in any way if it is in a wet or frozen condition. A moist loam borrow is desirable.

- C. Soil additives shall be spread and thoroughly incorporated into the layer of loam borrow by harrowing or other methods reviewed by the Landscape Architect. The following soil additives shall be incorporated:
1. Ground limestone or acidulant as required by soil analysis to achieve the required Ph.
  2. Fertilizer at the rate and of analysis recommended by the soil analysis
  3. Other soil amendments as required by soil analysis.
- D. Sufficient grade stakes shall be set for checking the finished grades. Stakes must be set in the bottom of swales and at the top of slopes. Deviation from indicated elevations that are greater than one-tenth of a foot shall not be permitted. Connect contours and spot elevations with an even slope. Finish grades shall be smooth and continuous with no abrupt changes at the top or bottom of slopes.
- E. During the compaction process, all depressions caused by settlement or rolling shall be filled with additional loam borrow and the surface shall be regraded and rolled until presenting a smooth and even finish corresponding to the required grades.
- F. The Contractor shall install loam borrow in successive horizontal lifts no thicker than 6 in turf areas and 12 inches in plant bed areas to the desired compaction as described herein. The Contractor shall install the soil at a higher level to anticipate any reduction of loam borrow volume due to compaction, settling, erosion, decomposition, and other similar processes during the warranty period. The Landscape Architect will ensure that the full depths of loam borrow for lawn and plant beds are obtained by digging holes in the loam borrow at the same frequency as for compaction testing.
1. Compact loam to the required density as specified herein.
  2. Maximum dry density for topsoils and loam shall be determined in accordance with ASTM D698. The following percentages of minimum to maximum dry densities shall be achieved for fill materials or prepared subgrades.
- In lawn and plant beds:
- |                                                                         |         |         |
|-------------------------------------------------------------------------|---------|---------|
| a. Fills within planting areas in top eighteen inches of finished grade | Minimum | Maximum |
|                                                                         | 80%     | 85%     |
3. The surface area of each lift shall be scarified by raking prior to placing the next lift.
- G. Select equipment and otherwise phase the installation of the loam borrow to ensure that wheeled equipment does not travel over subsoil, placed fills or ordinary borrow or already installed soil.
- H. Disturbed areas outside the limit of lawn work shall be graded smooth and spread with a minimum of 6 inches of loam borrow to the finished grade.

- I. Annual planting beds shall be graded smooth and spread with a minimum of 12 inches of loam borrow to the finished grade.

### 3.03 ACCEPTANCE

- A. Confirm that the final grade of the loam borrow is at the proper finish grade elevations. Adjust grade as required to meet the contours and spot elevations noted on the Plans. Request the presence of the Landscape Architect to inspect final grade. Do not proceed with the remaining work of this Contract until the Landscape Architect has given his/her written approval of the final grade.

END OF SECTION



## SECTION 32 92 19

### TURF & GRASSES

#### PART 1 – GENERAL

##### 1.01 RELATED DOCUMENTS

- A. The General Documents, as listed on the Table of Contents, and applicable parts of Division 01, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Contract Documents and all other Sections of the Specifications for requirements therein affecting the work of this trade.

##### 1.02 SUMMARY

- A. The work of this Section consists of providing all labor, equipment, materials, incidental work, and construction methods necessary to perform all lawn installation and fine grading work and related items as indicated on the Contract Documents and/or as specified in this Section and includes, but is not necessarily limited to, the following:
  - 1. Seeding
  - 2. Maintenance and protection

##### 1.03 RELATED WORK UNDER OTHER SECTIONS

- A. The following items of related work are specified and included in other Sections of the Specifications:
  - 1. Division 32 Section - PLANTING SOILS

##### 1.04 REFERENCES

- A. Not Applicable.

##### 1.05 SUBMITTALS

- A. Submit proof of landscape contractor's experience to the Landscape Architect in accordance with Quality Assurance paragraph of this Section.
- B. At least 30 days prior to intended use, the Contractor shall provide the following samples and submittals for approval in conformance with the requirements of

Section, Submittals. Do not order materials until Landscape Architect's approval of samples, certifications or test results has been obtained. Delivered materials shall closely match the approved samples. Acceptance shall not constitute final acceptance. The Landscape Architect reserves the right to reject on or after delivery any material that does not meet these Specifications.

1. Material Sampling and Testing of Loam Borrow from Off-Site Sources shall be specified, performed and paid for under Section, Planting Soils, of this Specification.
2. Fertilizer:
  - a. Submit product literature of seeding fertilizer and certificates showing composition and analysis.
  - b. Submit the purchasing receipt showing the total quantity purchased for the project prior to installation.
3. Seed: Submit a manufacturer's Certificate of Compliance to the Specifications with each shipment of each type of seed. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates.
4. Sod composition: submit information illustrating the seed types used for each type of sod.
5. Hydroseeding: Prior to the start of hydroseeding, submit a certified statement for approval as to the number of pounds of materials to be used per 100 gallons of water.
6. Wood Cellulose Fiber Mulch: Submit copies of manufacturer's literature and one material sample.
7. Limestone: Submit supplier's certification that the limestone being supplied conforms to these Specifications.
8. All additives needed to amend a specific soil in order to meet these specifications.

#### 1.06 EXAMINATION OF CONDITIONS

- A. All areas to be improved shall be inspected by the Contractor before starting work and any defects such as incorrect grading, or drainage problems shall be reported to the Landscape Architect prior to beginning this work. The commencement of work by the Contractor shall indicate his acceptance of the areas to be improved, and he shall assume full responsibility for the work of this Section, Seeding.
- B. The Contractor shall be solely responsible for judging the full extent of work requirements involved.

## 1.07 QUALITY ASSURANCE

- A. Qualification of Landscape Contractor: The work of this Section, Seeding, shall be performed by a landscape contracting firm which has successfully installed work of a similar quality, schedule requirement, and construction detailing with a minimum of five years' experience. Proof of this experience shall be submitted per Submittals paragraph of this Section, Seeding.
- B. Qualification of Foreman or Crew Leader: All work of seeding shall be supervised by a foreman or crew leader who is a certified landscape professional or a certified horticulturist.
  - 1. Certification shall be current. Proof of certification shall be submitted per Submittals paragraph of this Section, Seeding.

## PART 2 – PRODUCTS

### 2.01 LOAM

- A. Loam borrow shall be specified, provided, installed and paid for under the work of the Section, Planting Soils, of this Specification.

### 2.02 SOIL ADDITIVES

- A. Soil additives shall be specified, and provided under Section, Planting Soils

### 2.03 TURF SEED

- B. Grass Seed: Fresh, clean, dry, new-crop seed complying with Association of Official Seed Analysts' "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- C. Seed mixture shall be fresh, clean, new crop seed. Grass shall be of the previous year's crop and in no case shall the weed seed content exceed 0.25% by weight. The seed shall be furnished and delivered in the proportion specified below in new, clean, sealed and properly labeled containers.

All seed shall comply with State and Federal seed laws. Submit manufacturer's Certificates of Compliance. Seed that has become wet, moldy or otherwise damaged shall not be acceptable. Chewings fescue, hard fescue, tall fescue and ryegrass shall contain *Acromonium* endophytes. Seed containing endophyte must be kept cool and dry at all times; do not stockpile in the sun.

D. Seed Mixture Composition for General Turf Conditions without Irrigation:

<u>Common Name</u>	<u>Germination By Weight</u>	<u>Purity Minimum</u>	<u>Proportion Minimum</u>
Creeping Red Fescue, or Chewings Fescue	50%	85%	95%
Kentucky Bluegrass	25%	85%	90%
Perennial Ryegrass	25%	90%	90%

1. Bluegrass and rye grass varieties shall be within the top 50 percent and 25 percent respectively, of varieties tested in National Turfgrass Evaluation Program, or currently recommended as low maintenance varieties by University of Massachusetts or the University of Rhode Island.
2. Seeding rate shall be 6 pounds per 1,000 square feet

2.04 FERTILIZERS

- A. Fertilizer shall be a commercial product complying with the State and United States fertilizer laws. Deliver to the site in the original unopened containers that shall bear the manufacturer's certificate of compliance covering analysis. Fertilizer shall contain not less than the percentages of weight of ingredients as recommended by the soil analysis specified, performed and paid for under the Section, Planting Soils, of this Specification.
- B. Phosphorus shall be superphosphate or triple superphosphate.

2.05 LIMESTONE

- A. Ground limestone for adjustment of loam borrow pH shall contain not less than 85 percent of total carbonates and shall be ground to such fineness that 40 percent will pass through 100 mesh sieve and 95 percent will pass through a 20 mesh sieve. Contractor shall be aware of loam borrow pH and the amount of lime needed to adjust pH to specification in accordance with testing lab recommendations.

2.06 WOOD CELLULOSE FIBER MULCH

- A. Mulch to cover hydroseeded areas with slopes less than 3 to one shall be fiber processed from whole wood chips and clean recycled newsprint in a 1:1 proportion manufactured specifically for standard hydraulic mulching equipment. Fiber shall not be produced from recycled material such as sawdust, paper, or cardboard.

- B. Moisture content shall not exceed 10 percent, plus or minus 3 percent as defined by the pulp and paper industry standards. Fiber shall have a water holding capacity of not less than 900 grams water per 100 grams fiber.
- C. The mulch shall be of such character that the fiber will be dispersed into a uniform slurry when mixed with water. It shall be nontoxic to plant life or animal life.
- D. The mulch shall contain a non-petroleum based organic tackifier and a green dye to allow for easy visual metering during application but shall be non-injurious to plant growth.

#### 2.07 HERBICIDES, CHEMICALS AND INSECTICIDES

- A. Provide chemicals and insecticides as needed for fungus or pest control. All chemicals and insecticides shall be approved by the Massachusetts Department of Food and Agriculture for the intended uses and application rates.
- B. Provide post emergent crab grass control throughout the maintenance period to ensure a germinated and mown lawn free of crab grass.

#### 2.08 WATER

- A. The Contractor shall be responsible to furnish his own supply of water to the site at no extra cost. If possible, the Owner shall furnish the Contractor upon request with an adequate source and supply of water at no charge. However, if the Owner's water supply is not available or not functioning, the Contractor shall be responsible to furnish adequate supplies at his own cost. All work injured or damaged due to the lack of water, or the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.
- B. Contractor shall keep log of watering schedule and volume applied. Log shall be signed by Foreman and submitted to Landscape Architect.

### PART 3 – EXECUTION

#### 3.01 FILLING AND COMPACTION

- A. Filling and compaction of loam shall be specified, performed and paid for under the work of the Section, Planting Soils, of this Specification.

#### 3.02 FINE GRADING

- A. Fine grading shall be specified, performed and paid for under the work of the Section, Planting Soils, of this Specification.

### 3.03 SEEDING

- A. Contractor shall obtain Landscape Architect's written approval of fine grading and bed preparation before doing any seeding.
- B. Limit of grading and earthwork shall be limit of seeding unless otherwise indicated on the Contract Documents. All areas disturbed outside the limit of seeding shall be prepared and seeded as specified herein at no additional cost.
- C. The season for seeding shall be from April 1 to June 1 and from August 15 to September 30. The actual planting of seed shall be done, however, only during periods within this season which are normal for such work as determined by weather conditions and by accepted practice in this locality. To prevent loss of soil via water and wind erosion and to prevent the flow of sediment, fertilizer, and pesticides onto roadways, sidewalks, and into catch basins, seed loam areas within 5 Days of spreading the loam.
- D. Seed only when the bed is in a friable condition, not muddy or hard.
- E. Seeding shall be by Hydroseeding Method specified as follows:
  - 1. Prior to the start of work, furnish a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of hydroseeding that can be covered with the quantity of solution in the hydroseeder.
  - 2. Hydroseed with wood cellulose fiber mulch at a rate of 46 pounds per 1,000 square feet or 2000 pounds per acre.
  - 3. For the hydroseeding process, a mobile tank with a capacity of at least 500 gallons shall be filled with water and the mixture noted above in the specified proportions. The resulting slurry shall be thoroughly mixed by means of positive agitation in the tank. Apply the slurry by a centrifugal pump using the hose application techniques from the mobile tank. Only hose application shall be permitted. At no time shall the mobile tank or tank truck be allowed onto the prepared hydroseed beds. The hose shall be equipped with a nozzle of a proper design to ensure even distribution of the hydroseeding slurry over the area to be hydroseeded and shall be operated by a person thoroughly familiar with this type of seeding operation.
  - 4. Contractor shall obtain Landscape Architect's written approval of fine grading and bed preparation before doing any hydroseeding.

5. Limit of grading and earthwork shall be limit of hydroseeding unless otherwise indicated on the Contract Documents. All areas disturbed outside the limit of hydroseeding shall be hydroseeded.
6. Seed only when the bed is in a friable condition, not muddy or hard. Construction methods shall conform to hydraulic method requirements specified in the Standard Specification.
7. Hydroseeding shall be a two-step process.
  - a. Step one shall consist of spreading 100 percent of the required seed uniformly over the prepared loam bed so that the seed comes into direct contact with the soil. To mark the progress of the hydroseeding operation the Contractor may add 10 percent of the wood cellulose fiber mulch to the slurry.
  - b. Step two shall consist of a separate application of wood cellulose fiber mulch immediately following the first step of hydroseeding noted above. Apply the wood cellulose fiber mulch at a rate of 2,000 pounds per acre.

#### 3.04 TURF MAINTENANCE

- A. Maintenance shall begin immediately after any area is seeded and shall continue for a 90 day active growing period for seeded areas past Final Acceptance; the completion of all lawn construction work, and until final acceptance of the project.
  1. In the event that seeding operations are completed too late in the Fall for adequate germination and growth of grass, then maintenance shall continue into the following Spring for the minimum 60 Day period. In addition, install blankets or netting to prevent loam degradation and movement over the winter. Submit product literature and samples to the Landscape Architect for review. Blankets and netting shall be placed in a timely manner at no additional cost to the Owner.
  2. Contractor shall be responsible for the timely care and maintenance of the existing turf areas in the park from receipt of Notice to Proceed until Final Completion. Maintenance shall include mowing (turf shall not be allowed to grow longer than 4 inches).
- B. Maintenance shall include reseeding , mowing, watering, weeding, fertilizing a minimum of two times in addition to the fertilizer incorporated by harrowing into the spread loam, and resetting and straightening of protective barriers. Lawn work maintenance shall also include chemical treatments as required for fungus and/or pest control.
- C. During the maintenance period, any decline in the condition of seeded areas shall require immediate action to identify potential problems and to undertake

corrective measures.

- D. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment.

1. The Contractor shall provide all labor and arrange for all watering necessary to establish an acceptable lawn. In the absence of adequate rainfall, watering shall be performed daily or as often as necessary to maintain moist soil to a depth of at least 2 inches for seeded areas. Begin watering immediately after seeding.
2. Watering shall be done in a manner that will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The Contractor shall furnish sufficient watering equipment to apply water to the required soil depths each 8-hour period.

- E. Protection

1. Turf areas shall be protected by a 4-foot high fence constructed with steel stakes set 18 inches in the ground at 10 foot intervals.
2. Barriers must be raised immediately after lawn construction and shall be maintained until Acceptance.

- F. After the grass in seeded areas has germinated, reseed all areas and parts of areas that fail to show a uniform stand of grass. Reseed such areas and parts of areas repeatedly until all areas are covered with a satisfactory growth of grass with no less than 20 grass shoots per square inch and 2,880 grass shoots per square foot. Reseeding together with necessary grading, fertilizing, and trimming shall be done at the Contractor's expense.

- G. Fertilizing: The first application of fertilizer is specified, provided, performed and paid for under the Section, Planting Soils.

### 3.05 APPLYING LIMESTONE

- A. The Contractor shall return to the site at the beginning of the next seeding season and spread limestone across all lawn areas installed under this Contract. The work of liming the fields shall be as specified under Section, Planting Soils, of this Specification, and performed and paid for under this Section, TURF & GRASSES. Limestone shall be spread at rates determined by the soil tests specified, performed and paid for under Section, Planting Soils.

### 3.06 ACCEPTANCE



- A. It is the expectation that the seeded and sodded turf will be accepted in advance of Memorial Day 2017. Acceptance of seeded turf and sod shall be in advance of contract Final Completion. If additional time is required for turf establishment, the Contractor shall notify the Landscape Architect in writing at least 60 days in advance of Final Completion.
- B. Following the minimum required maintenance periods for lawn construction, the Contractor shall request the Landscape Architect in writing for a formal inspection of the completed work. Request for inspection shall be received by the Landscape Architect at least 10 days before anticipated date of inspection.
- C. Acceptance Requirements
  - 1. At the end of the maintenance period, seeded areas shall have a close stand of grass as defined above with no weeds present and no bare spots greater than 3 inches in diameter over greater than 5 percent of the overall seeded area. At least 90 percent of the grass established shall be permanent grass species. If seeded areas are deficient, the Contractor's responsibility for maintenance of all seeded areas shall be extended until deficiencies are corrected. Seeded areas to be corrected shall be prepared and reseeded in accordance with the requirements of this Section, TURF & GRASSES.
  - 2. At the time of acceptance, the Contractor shall remove temporary barriers used to protect lawn areas.
- D. Furnish full and complete written instructions for maintenance of the seeded areas to the Owner at the time of acceptance in conformance with Submittals requirements.
- E. Landscape Architect's inspection shall determine whether maintenance shall continue in any part.

### 3.07 CLEAN UP

- A. Absolutely no debris may be left on the site. Excavated material shall be removed as directed. Repair any damage to site or structures to restore them to their original condition, as directed by the Landscape Architect, at no cost to the Owner.
- B. Clean wheels of vehicles before leaving site.

END OF SECTION

# TOWN HALL GARDEN WATER FEATURES

Town of Arlington, Massachusetts

## Pre-Design Report



*Image courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*

**Draft** November 2, 2017

**kzla**

KYLE ZICK LANDSCAPE ARCHITECTURE, INC

36 Bromfield Street, Suite 202, Boston, MA 02108

t: 617-451-1018 e: [kzick@kylezick.com](mailto:kzick@kylezick.com) [www.kylezick.com](http://www.kylezick.com)



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- Olmsted Brothers
- 1999 Restoration

### 2017 Conditions & Preservation Recommendations

## Project Intent

To restore the water features to the historic intent of the Olmsted Brothers' 1939 design.

## Project Goals

- Rebuilding main reflecting pool
- Repair the upper basin, mid basin, and ripple spillway
- Install new mechanical system and upgrade the underground vault
- Develop a maintenance and operations plan for restored water features

# TOWN HALL GARDEN WATER FEATURES RESTORATION

## Review of Archival Materials

- Records for Job # 2252 at the Olmsted Archives, Frederick Law Olmsted National Historic Site (Plans, photographs, and planting lists, 1938-1941)
- Records for Job # 2252 at the Library of Congress Olmsted Associates Records (Correspondence and planting lists, 1938-1941)
- Archival plans and photographs from Town of Arlington Vault (historic plans and photographs from 1998 restoration)
- Sketchbooks and Notebooks from the office of R. Clipston Sturgis, 1886-1948. Boston Athenaeum
  - Architectural sketchbooks No. 48: (February 1911) through No. 53. (October 1913)
  - “Plan of Memorial Town Garden/in Connection with the Arlington Town Hall”, revised April 17th, 1912
  - “The Arlington Town Hall”, 1911
- National Register/Massachusetts Cultural Research Information System (MACRIS) Nomination Forms
  - ARL.922: Menotomy Indian Hunter
  - ARL.A: Arlington Center Historic District/National Register District (07/18/1974)
  - ARL.F: Arlington Center Historic District/National Register District (09/27/1985)
  - ARL.P: Arlington Multiple Resource Area/National Register MRA (09/27/1985)
- *Arlington Civic Block Master Plan* (1998) and the *Arlington Civic Block Master Plan Update* (2000)
- The Cyrus E. Dallin Art Museum, Arlington, MA
- Winfield Robbins Memorial Gardens Historic Restoration Plans, prepared by Pat Loheed Landscape Architect
  - “Phase IA”, dated April 22, 1998
  - “Phase IA As-built Plan & Details”, dated September 1999
  - “DEM Contract”, March 18, 1999
- *Menotomy Indian Hunter Fountain Evaluation Report*, prepared by Weston & Sampson Engineers, Inc. (2016)
- *Menotomy Fountain Restoration Project, Schematic Design Narrative*, prepared by Weston & Sampson Engineers, Inc. (September 2017)
- *Town of Arlington, Open Space Plan*, 2015-2022
- Digital Commonwealth on-line. <http://ark.digitalcommonwealth.org>
- Historic New England Library and Archives

## Historical Significance

Per the project Request for Qualifications: The Garden has demonstrated historical significance at all levels. In 1974, the Garden was listed on the State Register of Historic places. Forming the heart of Arlington's Civic Block, the garden is located within the Arlington Center Historic District, which is designated on the National Register of Historic Places. The Massachusetts Historical Commission holds a permanent Preservation Restriction on the garden and grounds.

## Character-defining features

Character-defining features are those features of a historic site that without which the landscape would cease to maintain its significance.

(Using the terminology for the features reflects that used by Sturgis and Olmsted Brothers.)

- a. Menotomy Indian Hunter sculpture and base (Cyrus Dallin)
- b. "Spring" (uppermost basin) with stone spillway (Olmsted Brothers)
- c. Upper pool (Olmsted Brothers)
- d. Ripple spillway with stepping stones (R. Clipston Sturgis)
- e. Lower pool with bluestone coping (R. Clipston Sturgis)
- f. Brick walkways (R. Clipston Sturgis)
- g. Brick forecourt (Olmsted Brothers)
- h. Circular cobble walkway (Olmsted Brothers)
- i. Woodland planting behind sculpture (Olmsted Brothers)
- j. Planting within walk around sculpture (Olmsted Brothers)
- k. Border planting outside brick walkways (Olmsted Brothers)
- l. Planting along lower basin (Olmsted Brothers)
- m. Spillway planting (Olmsted Brothers)
- n. View up to sculpture (Olmsted Brothers)
- o. View from sculpture down towards lawn and street (Olmsted Brothers)



# TOWN HALL GARDEN WATER FEATURES RESTORATION

## Design Evolution

According to the Arlington Civic Block Master Plan from 1998, the land for the new Town Hall and associated gardens was purchased by the Town in 1910.

A 1913 photograph in the Town archives shows the site with the relocated Whittemore-Robbins House and the Central School. In the landscape between, appears to be a wet areas that may have been the inspiration for Dallin and Sturgis' spring. It is also likely the stream that ran from the site to the Old Burying Ground, which—according to the Arlington Historical Society's article on the Old Burying Ground: "This was the site that the brook that ran through the cemetery which is now the crushed stone path that connects Library Way to Pleasant Street." (Written by Ralph D. Sexton, 2000.)



*"Arlington Center" prior to the construction of Sturgis' town hall, 1897; Image courtesy of Digital Commonwealth*

## Cyrus Dallin

Cyrus Dallin (1861-1944) was a significant American sculptor who is best known for his bronze sculptures of Native Americans, including the Appeal to the Great Spirit located outside Boston's Museum of Fine Arts, as well as the Equestrian Statue of Paul Revere in Boston's North End. Dallin was a resident of Arlington from 1900 on.

In 1911, Dallin created the Metonymy Indian Hunter after being commissioned by the Robbins family.



## TOWN OF ARLINGTON



*"Town hall site 1911 Arlington High School."; prior to the construction of Sturgis' town hall; Image courtesy of Digital Commonwealth*



*"Town hall site, 1911 view from C.H. Gannetts, Academy St." prior to the construction of Sturgis' town hall; Image courtesy of Digital Commonwealth*

# TOWN HALL GARDEN WATER FEATURES RESTORATION

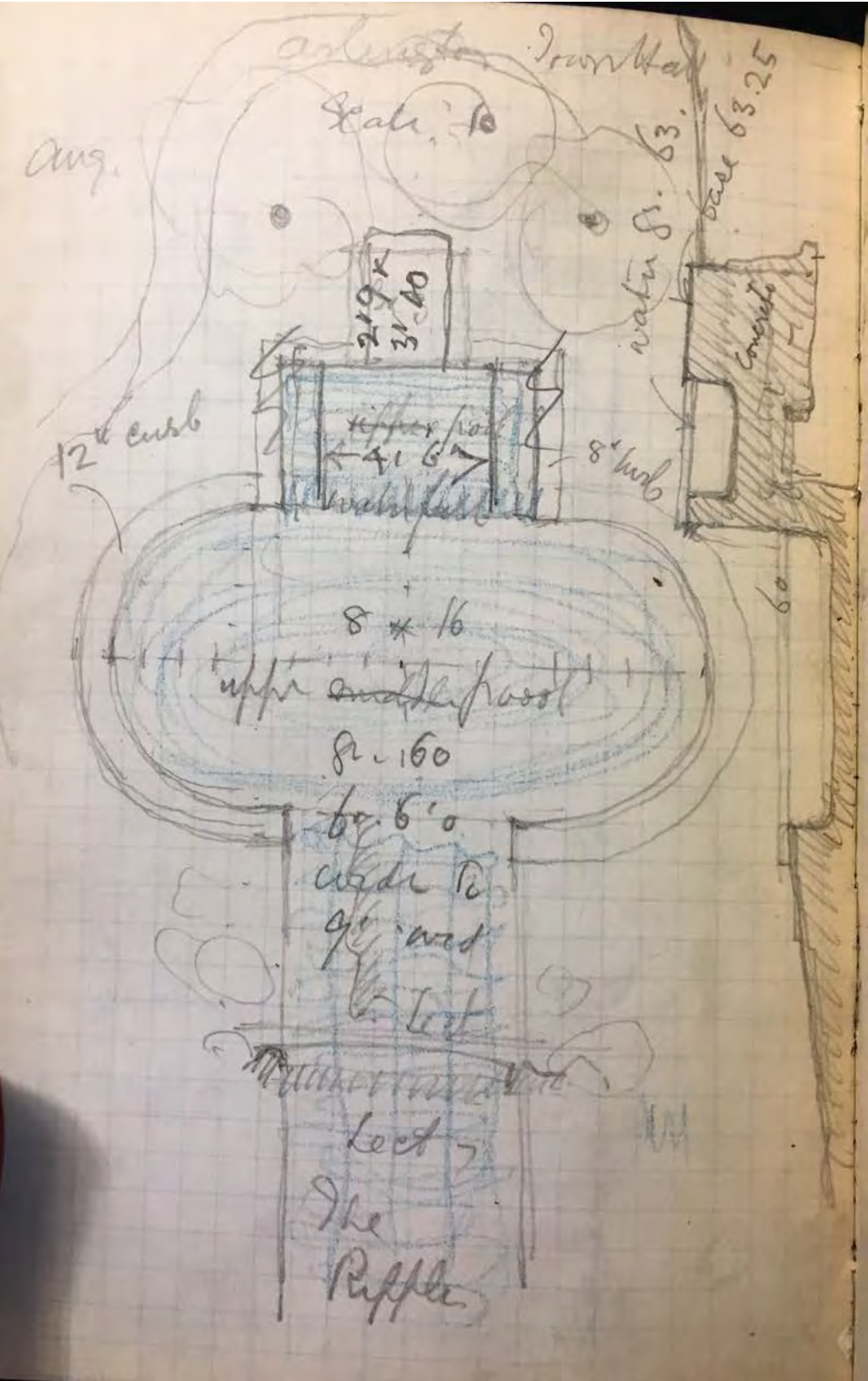
## R. Clipston Sturgis

R. Clipston Sturgis was the original designer of the Memorial Town Garden in 1913, as well as the Amos Robbins Memorial Town Hall, in 1912. He was commissioned by the Robbins sisters, Ida and Caira, to design the gardens adjacent to his Town Hall building.

Sturgis' design created all of the elements of the water features that exist today. The spring, the upper pool, the ripple, and lower pool were all designed by Sturgis. (These are the terms Sturgis used in his sketches, and will be use throughout the report.)

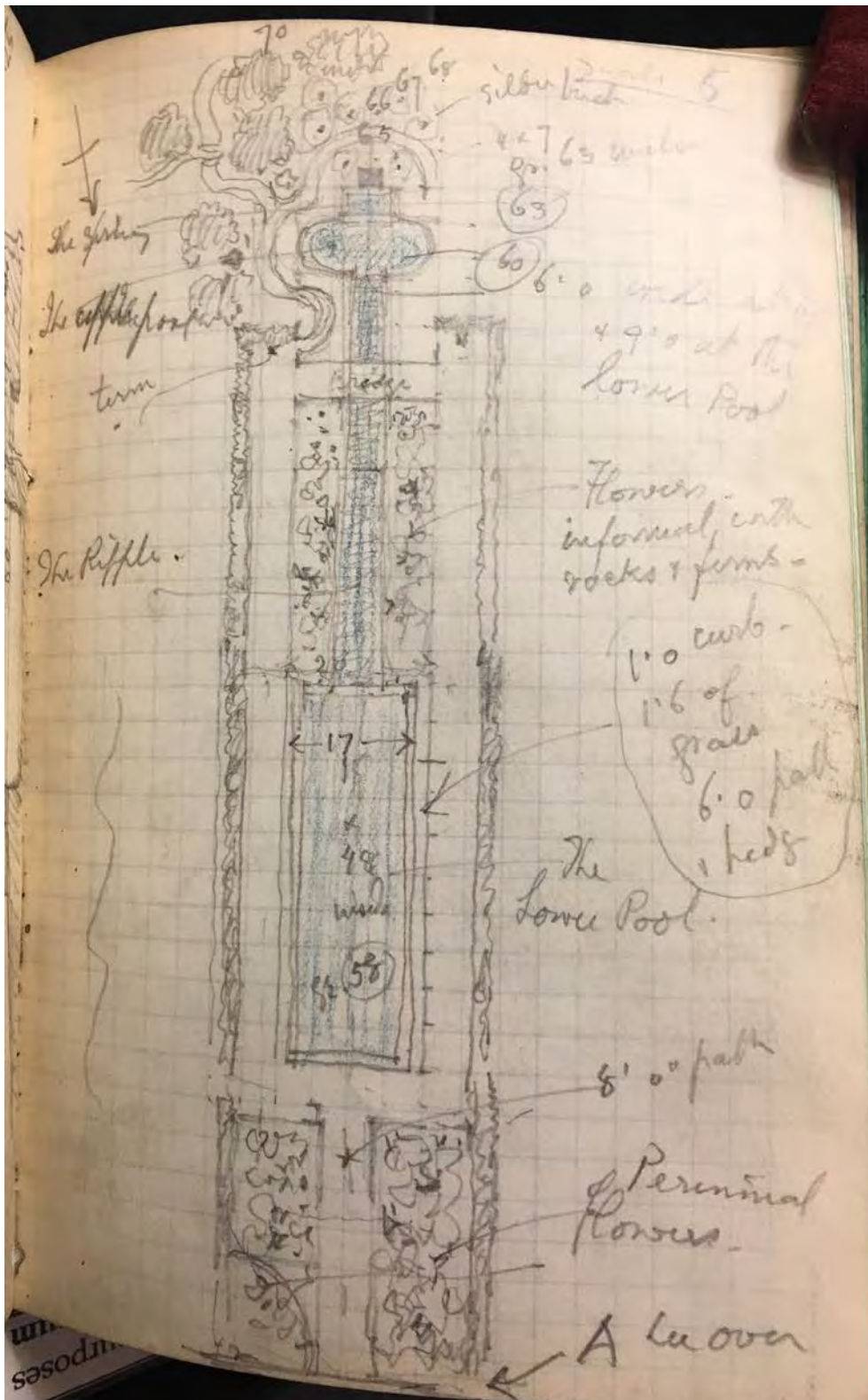
Plans for Sturgis' design are limited, but two record plans were located in the Town of Arlington's vault and three sketches were included in his sketchbooks archived at the Boston Athenaeum. The sketches are in sketchbook No. 49, dated from June 7, 1911 to November 4, 1911; the sketches have no date associated to them but are labeled "Arlington Town Hall". The first sketch is an enlargement of the spring and upper pool with dimensions and elevations. It notes that the concrete curbs are 12" wide with the exception of the curb on either side of the spring, which is 8" wide. The second sketch shows the water feature from behind the sculpture to the brick to the north of the lower pool. Here too, elevations and dimension are included and appear to be consistent with the final plan on record. Planting notes include the mention of a silver birch behind the sculpture and "Flowers - informal with rocks and ferns". Adjacent to the lower pool is noted "1'-0" curb. 1'-6" of grass. 6'-0" tall hedge". The final sketch is of the intersecting brick walkway which was removed by the Olmsted Brothers work.





Sketches of Memorial Town Garden in R. Clipston Sturgis' Sketchbook No. 49, dated from June 7, 1911 to November 4, 1911; Image courtesy of the Boston Athenaeum

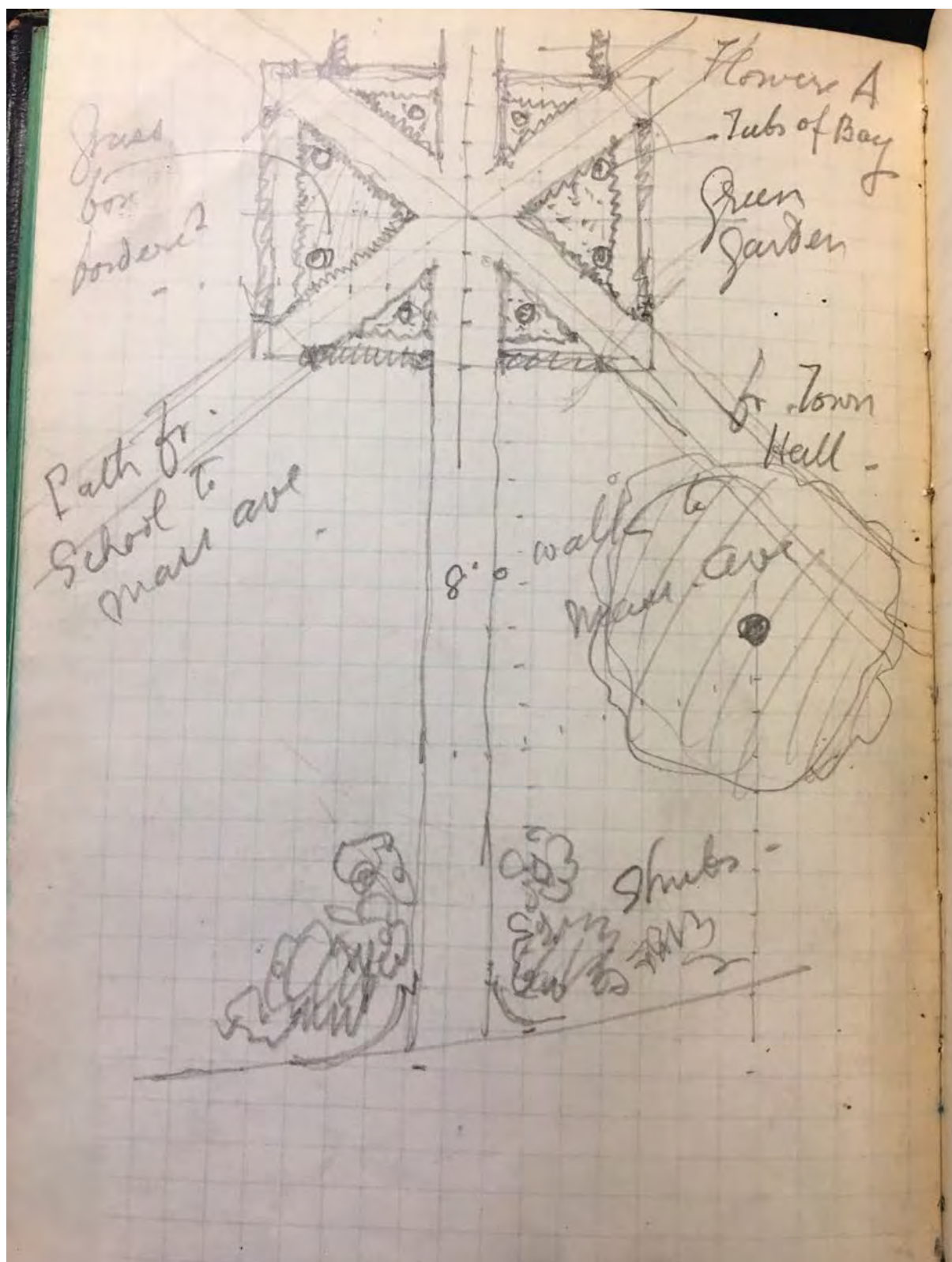
# TOWN HALL GARDEN WATER FEATURES RESTORATION



Sketches of Memorial Town Garden in R. Clipston Sturgis' Sketchbook No. 49, dated from June 7, 1911 to November 4, 1911; Image courtesy of the Boston Athenaeum



# TOWN OF ARLINGTON



Sketches of Memorial Town Garden in R. Clipston Sturgis' Sketchbook No. 49, dated from June 7, 1911 to November 4, 1911; Image courtesy of the Boston Athenaeum

## TOWN HALL GARDEN WATER FEATURES RESTORATION

The two plans from Sturgis were located in the Town Archives. One is a plan entitled “Plan of Memorial Town Garden/in Connection with the Arlington Town Hall”, dated revised April 17th, 1912. The plan shows the entire grounds from Town Hall to a gravel court adjacent to the Robbins Library. It shows the entire water features and the brick walks, lawn and gardens around them. All the components were constructed of concrete and were formal in nature. The sculpture sits on a concrete plinth that is 2’-10” wide by 2’-9” deep and is situated at elevation 64.25. (All dimensions and elevations are as noted on the 1912 “Plan of Memorial Town Garden/in Connection with the Arlington Town Hall”.) The upper basin, labeled on the plans as the “spring” is 6 feet wide by 5 feet deep at elevation 62.75. The concrete walls are all 12 inches thick. The middle basin (labeled on the plan as the “upper pool” is an oval that is 24 feet wide by 10 feet deep, including the 12 inch concrete walls. It is recorded at an elevation of 59.75. “The ripple” spillway is 8 feet wide at the top and widens to 11 feet where it meets the lower basin. The “lower pool” is 50 feet long by 17 feet wide. Where the spillway meets the lower basin, is elevation 57.875, with the bottom of the lower basin at elevation 56, the top of the coping stones at 58.25 and the walkway elevation at 58, making the lower basin a depth of 2’-3”—much deeper than today’s basin. Sturgis’ water feature is crossed by an arched concrete bridge. The only details on this plan include a section of the ripple and elevations of the bridge, section of upper pool and ripple, and section of lower pool showing ripple and overflow.

The plantings shown on this plan include a heavily plated area behind the sculpture and 30-inch gravel walk which surrounds it. While no legend is included for the plantings, the labels “H”, “CB”, “WP”, “RP”, “NS”, and “WB” presumably relate to hemlock, cherry birch (unconfirmed), white pine, red pine, Norway spruce, white birch, respectively. One shrub is labeled in this area along the west side of the planting and is noted as “18 *Pinus mugo*”. Immediately behind the sculpture are four hemlock and four white birches. The other woody plantings identified include hedges of *Ligustrum ibotum* (now *L. ibota*) or Japanese privet and *Ligustrum regelianum* (now *L. obtusifolium* var. *regelianum*) or Regal’s border privet. The planting bed between the brick walks and the ripple show a selection of perennials (Japanese iris, Siberian iris, yellow flag iris, and daylilies) planted among boulders. The planting bed between the walks and lower pool is noted as grass.

The second plan is entitled “The Arlington Town Hall”, dated 1911. It shows a smaller version of the 1912 plan from Academy Street to the edge of the Robbins Library property bounds, and from Massachusetts Avenue to the Central School property bounds. Additional information locates ledge around the Town Hall and a dry well detail to accommodate the subsurface drainage. A section of the brick walkway is also included. The remainder of the plan sheet has a cross-section section of the ripple. An enlargement of the water features is also included which shows the concrete work that comprises all of the features, included footings (no dimensions) and the thickness of the curbs (consistently 12”) and base concrete: 6” for the ripple and the lower pool; 4” for the upper pool and spring.

The second plan only references vegetation by noting where to excavate for the plants, including the hedges along the brick walkways and “15 birch trees and 50 spruce” around and behind the sculpture.

Dallin’s sculpture was the focal point of the gardens. Sturgis’ Italianate Victorian inspired design is a manicured and formal landscape. (Photographs included in the Olmsted firm archives document the landscape in 1938 when they were first engaged to redesign the landscape. Many of the photographs look at the broader landscape, as the firm was hired to rehabilitate the grounds of Town Hall and the Massachusetts Avenue sidewalk, as well as the water features.) From the “spring”, water sheet-flows down the concrete face into Sturgis’ “upper pool”. Some of the historic images appear to show the pool with a dark tone to the base.

## TOWN OF ARLINGTON

The plantings behind the sculpture are sparse on the ground plan, a long grass, or meadow look with several birch, and pines trees, and black walnuts flanking the sculpture. The entire water feature is liner with a privet hedge and a brick walkway which ran from Massachusetts Avenue directly toward the sculpture reinforcing the formality of Sturgis' design.

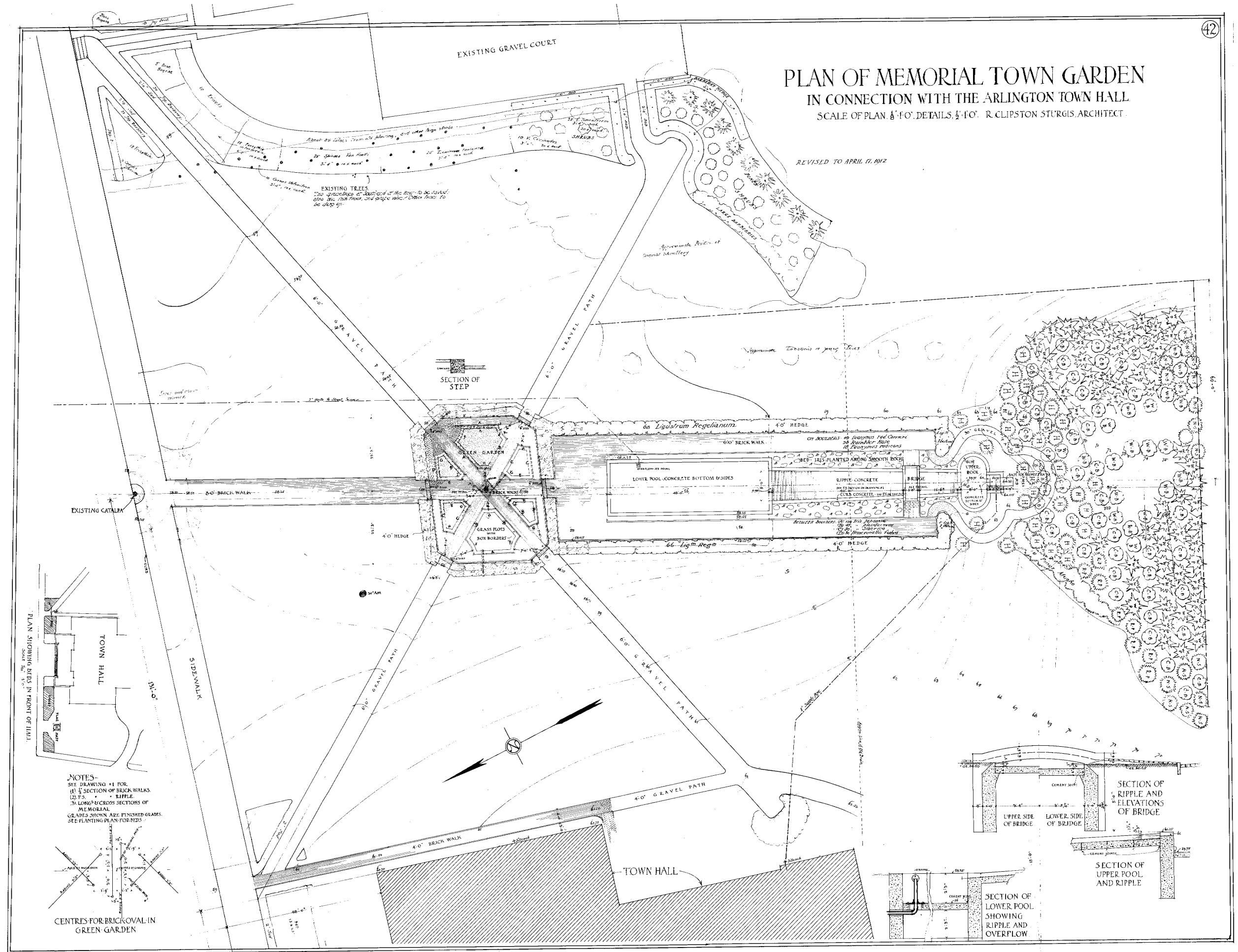
The sculpture and Sturgis' Memorial Town Garden were dedicated on June 25th, 1913.



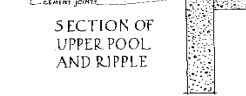
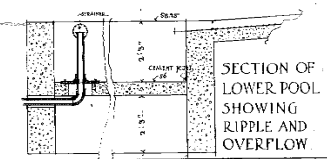
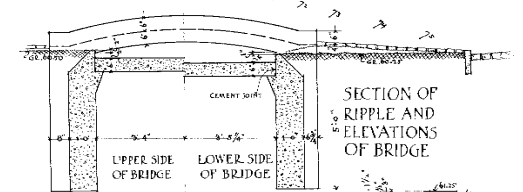
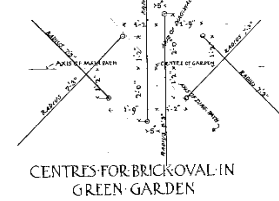
# PLAN OF MEMORIAL TOWN GARDEN IN CONNECTION WITH THE ARLINGTON TOWN HALL

SCALE OF PLAN  $\frac{1}{8}"=1'-0"$ , DETAILS  $\frac{1}{4}"=1'-0"$  R. CLIPSTON STURGIS, ARCHITECT.

REVISED TO APRIL 17, 1912

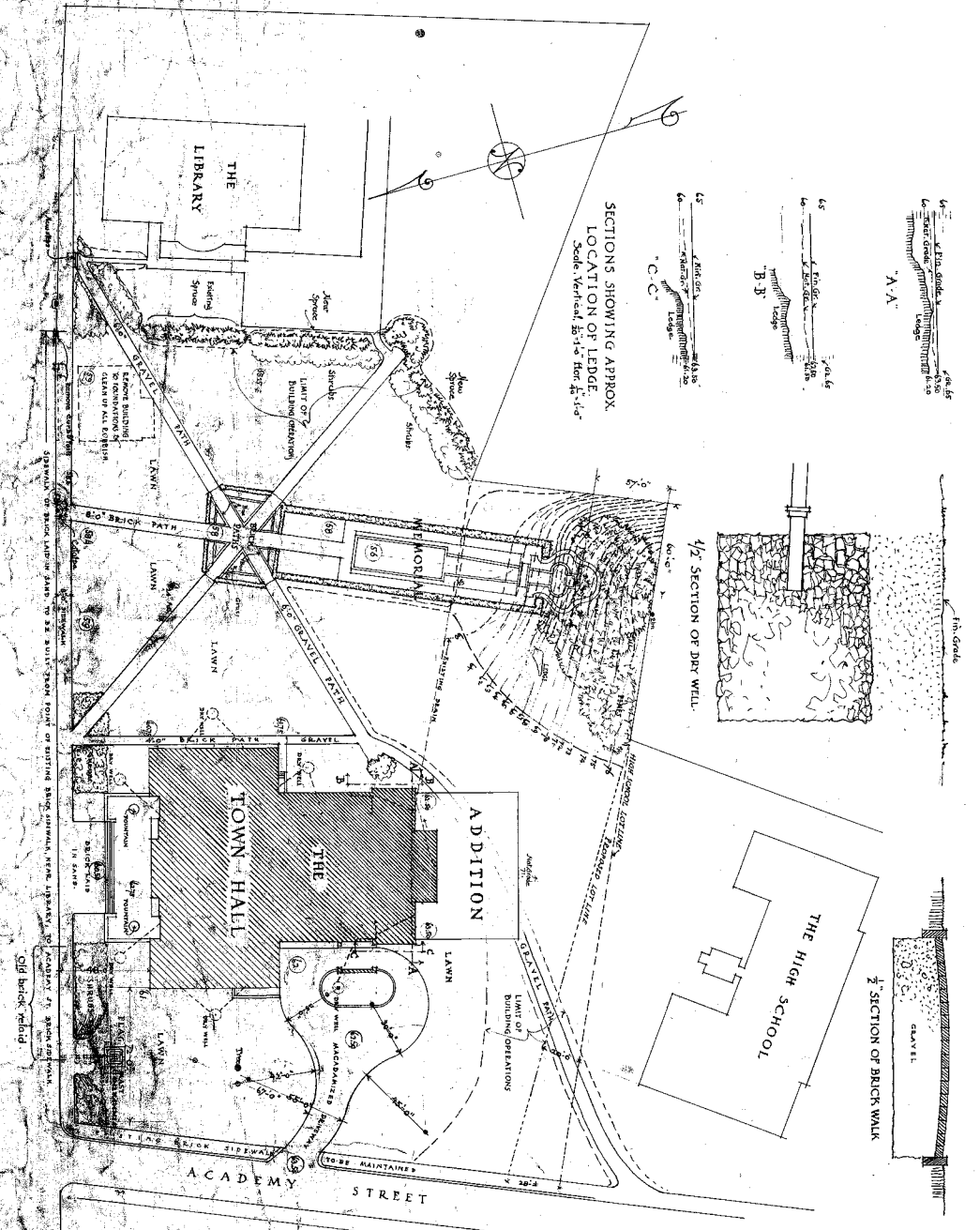
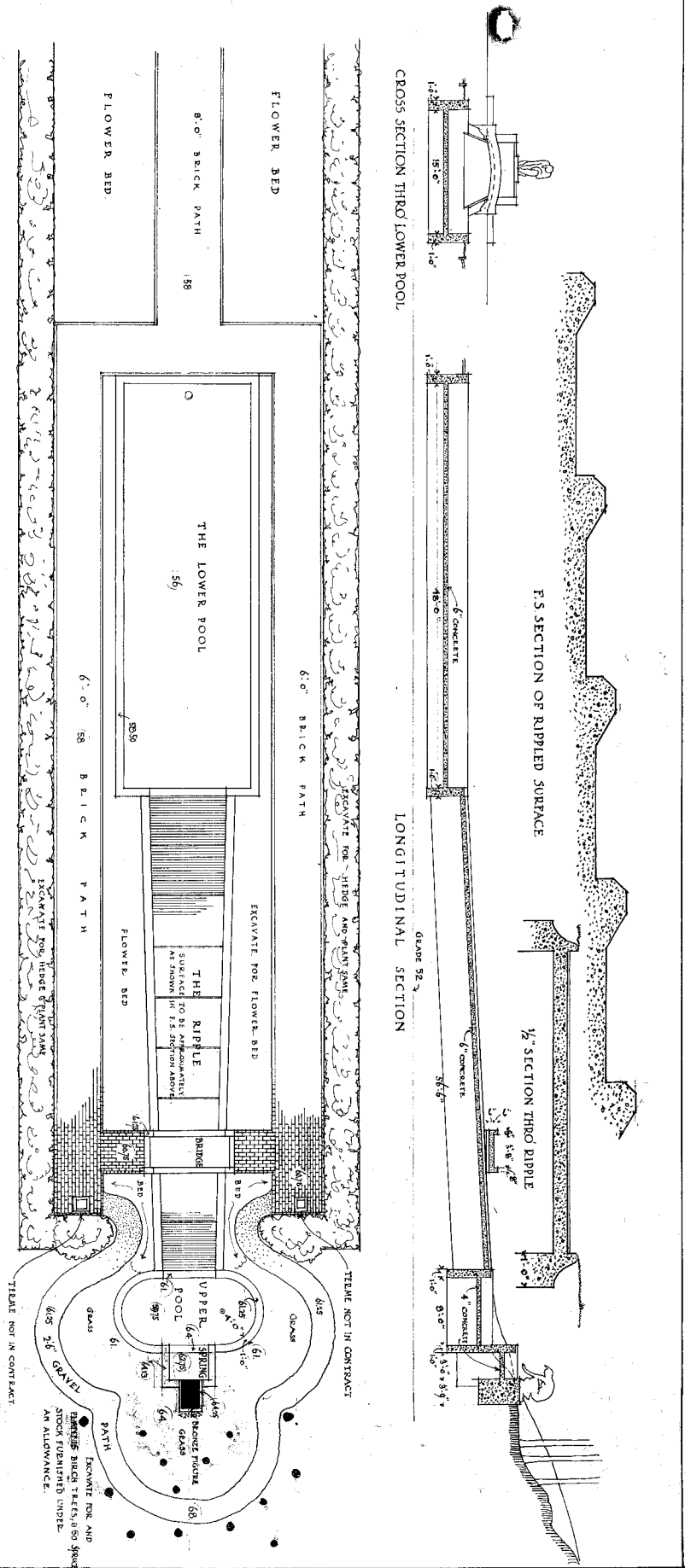


NOTES-  
SEE DRAWING #1 FOR  
(1) SECTION OF BRICK WALKS.  
(2) F.S. \* \* \* RIFPLE.  
(3) LONG & CROSS SECTIONS OF  
THE BRIDGE.  
GRADES SHOWN ARE FINISHED GRADES.  
SEE PLANTING PLAN FOR BRIDGES.



"Plan of Memorial Town Garden in Connection with the Arlington Town Hall", dated "Revised" April 17th, 1912; Courtesy of the Town of Arlington





THE ARLINGTON TOWN HALL  
MASSACHUSETTS AVENUE  
R. CLIPSTON STURGIS, ARCHITECT BOSTON 1011

"The Arlington Town Hall", dated 1911; Courtesy of the Town of Arlington

## TOWN HALL GARDEN WATER FEATURES RESTORATION



*"Arlington Center - Massachusetts Avenue" showing Sturges' path system, no date; Courtesy of Digital Commonwealth*



## TOWN OF ARLINGTON



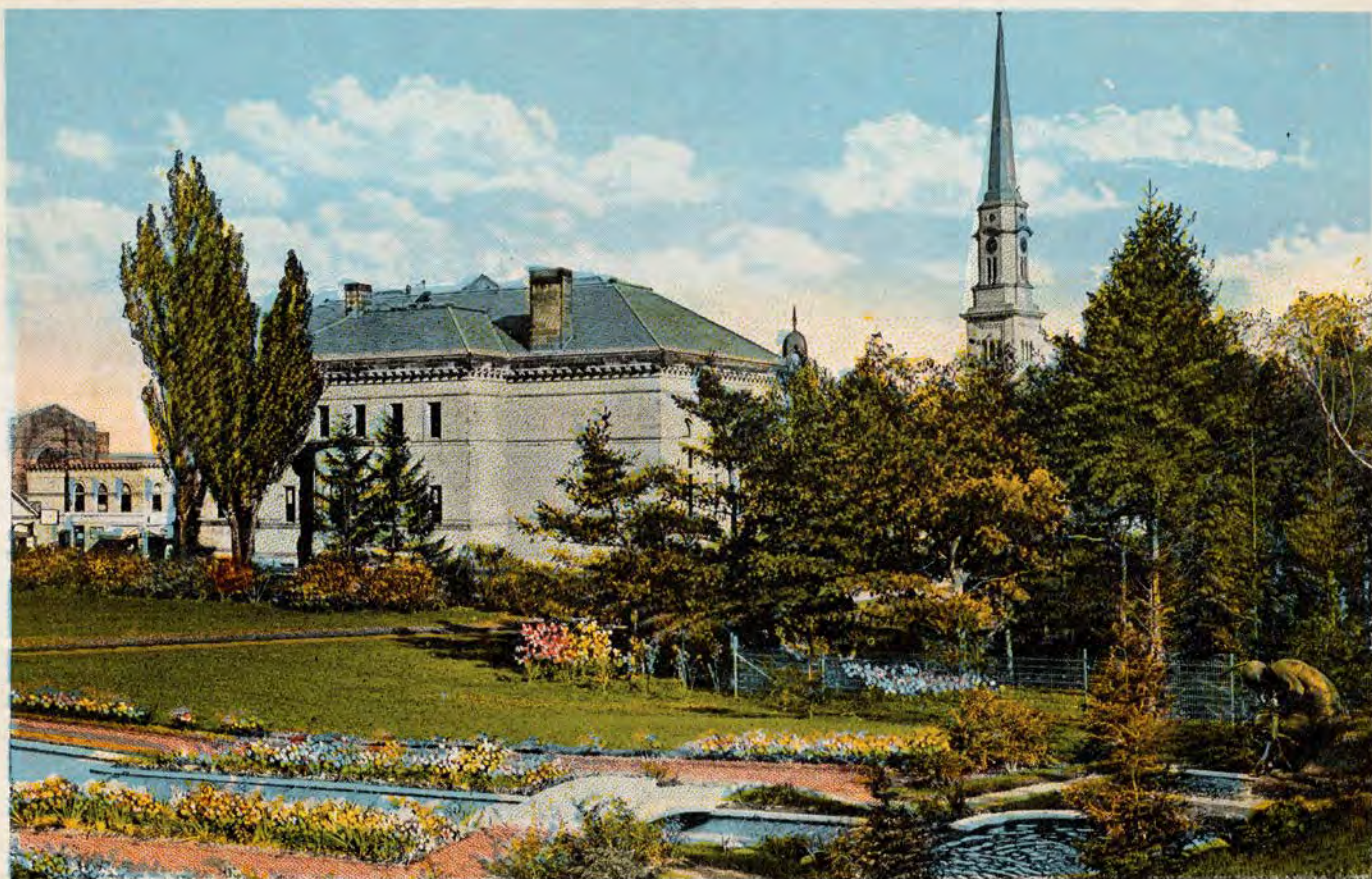
*"Public garden, Arlington, Mass.", no date (circa) 1913; Courtesy of Digital Commonwealth*



*"Menotomy Indian fountain, Arlington, Mass." no date (circa) 1920; Courtesy of Digital Commonwealth*



## TOWN HALL GARDEN WATER FEATURES RESTORATION



**LIBRARY FROM ROBBINS MEMORIAL GARDEN, ARLINGTON, MASS.**

*"Public garden, Arlington, Mass.", no date (circa) 1913; Courtesy of Digital Commonwealth*



**THE FOUNTAIN, ROBBINS MEMORIAL GARDEN, ARLINGTON, MASS.**

*"The fountain, Robbins Memorial Garden, Arlington, Mass." no date (circa) 1913; Courtesy of Digital Commonwealth*



## TOWN OF ARLINGTON



*"Winfield Robbins memorial town garden", no date; Courtesy of Digital Commonwealth*



## TOWN HALL GARDEN WATER FEATURES RESTORATION



*Image 2252-59, dated July 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



*Image 2252-4, no date; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



## TOWN OF ARLINGTON



*"Menotomy fountain, town hall grounds, Arlington, Mass.", no date (circa) 1913; Courtesy of Digital Commonwealth*



*"Winfield Robbins Memorial Garden.", circa 1911; Courtesy of Digital Commonwealth*



## TOWN HALL GARDEN WATER FEATURES RESTORATION



*"Indian Hunter, Robbins Memorial Garden" no date (circa) 1913; Courtesy of Digital Commonwealth*



## TOWN OF ARLINGTON



*Image 2252-7, no date; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



*Image 2252-13, dated May 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



## TOWN HALL GARDEN WATER FEATURES RESTORATION



*Images 2252-39 and 2252-44, dated July 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



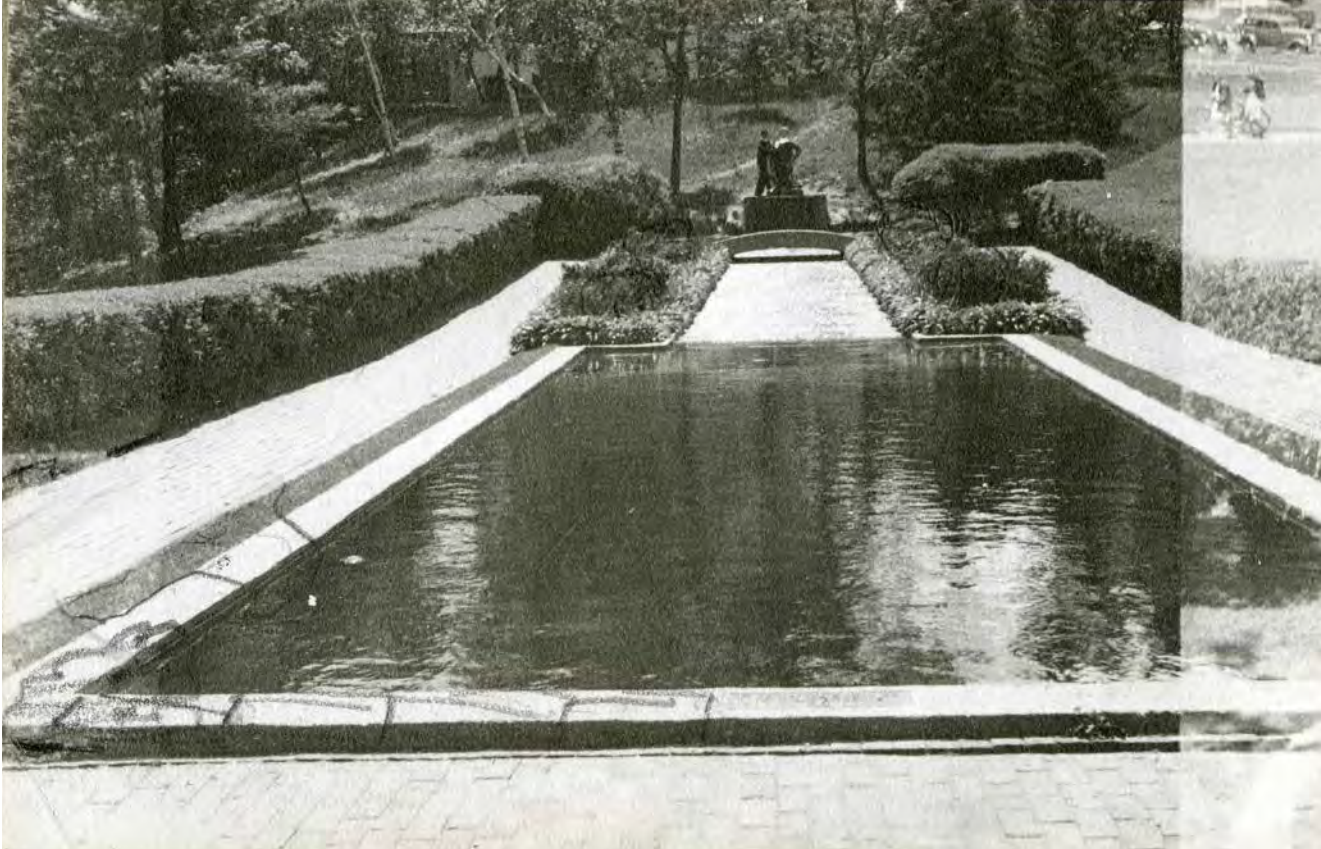
*Image 2252-42, dated July 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



## TOWN OF ARLINGTON



*Image 2252-43, dated July 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



*Image 2252-12, dated May 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



## TOWN HALL GARDEN WATER FEATURES RESTORATION



*Image 2252-49, dated July 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*



*Image 2252-50, dated July 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*

## Olmsted Brothers

In 1938, the Robbins sisters hired the renowned landscape architecture firm, Olmsted Brothers of Brookline, to redesign the gardens in a more picturesque style. James (“Fred”) F. Dawson worked for the Olmsted Brothers firm from 1896-1941—Olmsted, Olmsted and Eliot as it was named when he started as an apprentice—and was the first associate partner to John Charles and Frederick Law Olmsted, Jr. He was the lead designer for the Winfield Robbins Memorial Gardens in Arlington.

The Olmsted Brothers’ designs for the Town Hall gardens kept the key water features intact. The ripple spillway, the lower pool, and the brick walks flanking them remain unchanged. The sculpture’s concrete base, the spring, and upper pool were rusticated with large boulders, and included the addition of a rock spillway from spring to upper pool. Sturgis’ arced concrete bridge was replaced with bluestone stepping stones that connected to the brick walks and across the ripple. (The stepping stones are 12 inches by 24 inches by 2-inch thick bluestone.) The plans also added the circular cobblestone walkway and boulder terracing behind the sculpture. Many of Sturgis’ plantings were maintained by the Olmsted Brothers’ design and created the backbone of the woodland planting palette.

There are a number of plans from the Olmsted firm archives that are useful for understanding the design intent and development for the water features and surrounding gardens:

- Plan No. 6 is entitled “Suggestions for Improving the Grounds”, originally dated June 14, 1938; Revised July 15, 1938. This is the first plan which shows design intent for the entire site. While some of the details changed prior to installation, the overall concept remains essentially unchanged. The plan shows a broad oval lawn adjacent to Massachusetts Avenue, a brick forecourt to the north of the existing water feature. The water feature remains with slight changes, many of which were not finalized. The planting concept is similar to the final planting which included “white pines, cedars, etc.” to the south, “dogwoods and birches and rhododendrons” behind the sculpture. The border planting lining the brick walks and lower basin and spillway are in their final form and labeled as “dogwoods, azaleas, etc.”
- Plan No. 8-A is entitled “Suggested Treatment for Natural Setting of Bronze Indian”, dated July 19, 1938. The sketch shows the sculpture in the upper pool, with the rustication of the concrete basins with boulders, including the stone spillway from upper to lower pool. The vegetation frames the sculpture with mid-level shrubs surrounding the pools. To the rear of the sculpture is the boulder wall which retains the circular walk where suggested are birch trees and some shrubs.
- Plan No. 8-B has the same title and date as Plan No. 8-A but shows a different view; that is, from the northwest of the sculpture. The planting and rustication are the same, with the one significant change being the additional of a (presumably) wrought iron fence behind the sculpture.
- Plan No. 16-A is entitled “Planting Plan”, dated May 18, 1939 with a final revision date of September 15, 1939. This is the final planting plan for the project, and as such the landscape elements reflect the final design intent. This includes the bluestone stepping stones, the circular walkway, the rusticated upper pools, and the benches.
- Plan No. 16-B is entitled “Planting Plan - Vicinity of Indian”, dated May 26, 1939 with a final revision date of July 19, 1939. This is an enlargement of the areas within the circular walkway.



## TOWN HALL GARDEN WATER FEATURES RESTORATION

- Plan No. 19 is entitled “Grading Plan”, dated November 1, 1938 with a final revision date July 19, 1938. The grading plan reveals that the “brick platform” is new construction with some bricks to be re-laid and half of it is a new brick surface. This plan also shows a fence behind the sculpture.
- Plan No. 21 is entitled “Detail of the Boulder Work around Indian”, dated November 7, 1938. This shows the rustic intent of the upper and middle pools that is created by overlaying the existing concrete basins with fieldstone. Some of the detail shown on this plan was not undertaken. It suggests replacing sculpture’s concrete plinth with large boulder and shifting the sculpture close to the “spring”; this was not undertaken, nor was the installation of fence behind the sculpture.
- Plan No. 25 is entitled “Details for the Wall near Pool and Pool Coping”, dated December 7, 1938. Section A-B on this plan shows the detail of the lower basin coping. It shows a 13.5-inch wide bluestone coping stone and notes only a  $\frac{3}{4}$ ” overhang on both sides. (This is consistent with the 12-inch wide concrete walls in the Sturgis plans. The plan on this sheet also notes a plaque: “Remove bronze plaque from existing concrete and reset on this piece of bluestone coping.” This plaque is not on site today, but it does appear in a photo from 1938.
- Plan No. 33 is entitled “Study Showing Stone Sizes near Indian”, dated February 27, 1938. This plan shows the layout intent of the boulders covering the concrete basins. This shows that the Sturgis’ “spring” was eliminated and replaced with the larger upper basin that was also constructed of a concrete. Dimensions are not included, but it is approximately three-quarters the size of the middle basin. The plan shows the bluestone stepping stones.
- Plan No. 45 is entitled “Layout Plan for Floodlights”, dated December 13, 1939. The plan shows the layout for the underground cable winding through what appears to be existing shrubs to both sides of the upper basin. The conduit comes from Town Hall through yews, hemlocks, blueberry bushes, and, mountain laurels.
- Plan No. 49 sheets 1 & 2 are updates the planting plan noted “Notes by J.F.D. and G.W. during visit July 26, 1940” These plans are updates to the original installation work noting plants that have died and are need of being replaced.
- Plan No. 50 is “entitled “Plan Showing Location of Fence (Rear of Indian)”, dated July 30, 1940. This sketch makes recommendations for a wicket fence to be placed along the “existing Belgium block walk” which is backed with a “prickly hedge” presumable to keep people away from the sculpture. Another addition includes a “proposed Belgium block walk which extends from the circular walk to the rear of the sculpture. It extends to two feet away from the sculpture and includes the same wicket fence (detailed in Plan No. 51). The side of the plan includes two sections with studies of two fence types: one appears to be similar to the fence shown in Plan No. 8-B and is labeled “wrought iron rail”; the second is a chain link fence.
- Plan No. 53 is a copy of enlargement Plan No. 16-B, with notes dated September 19, 1941, but it includes revisions to the area within the circular walkway which adds “flat natural stones for path; adjust planting here” extending from the benches to the middle pool. To the rear of the sculpture, the notes state: “leave wicket fence here on each side; pave with flat natural stones (not flag); put in 2 or 3 taxus (dwarf nana) each side and adjust other planting”.

Plans continued to be developed through 1940 and 1941 showing proposed changes around the sculpture. It is clear that visitors have always wanted to be in proximity to the sculpture and not just view it from afar. The Olmsted firm proposed fencing for the rear of the sculpture, an overlook from the cobblestone circular walk, wicket fencing along the circular walk, “keep out” signs for the planting areas, and even prickly shrub plantings to keep visitors out of the areas immediately adjacent. It is also worth noting that the 1938 photographs show desire lines and compacted earth with little or no vegetation immediately around the sculpture. This has clearly been a persistent issue.

The firm also made repeated visits to the site in September and October 1939, July 1940, May 1941 and September 1941 to review plant materials that had died and/or needed to be replaced.

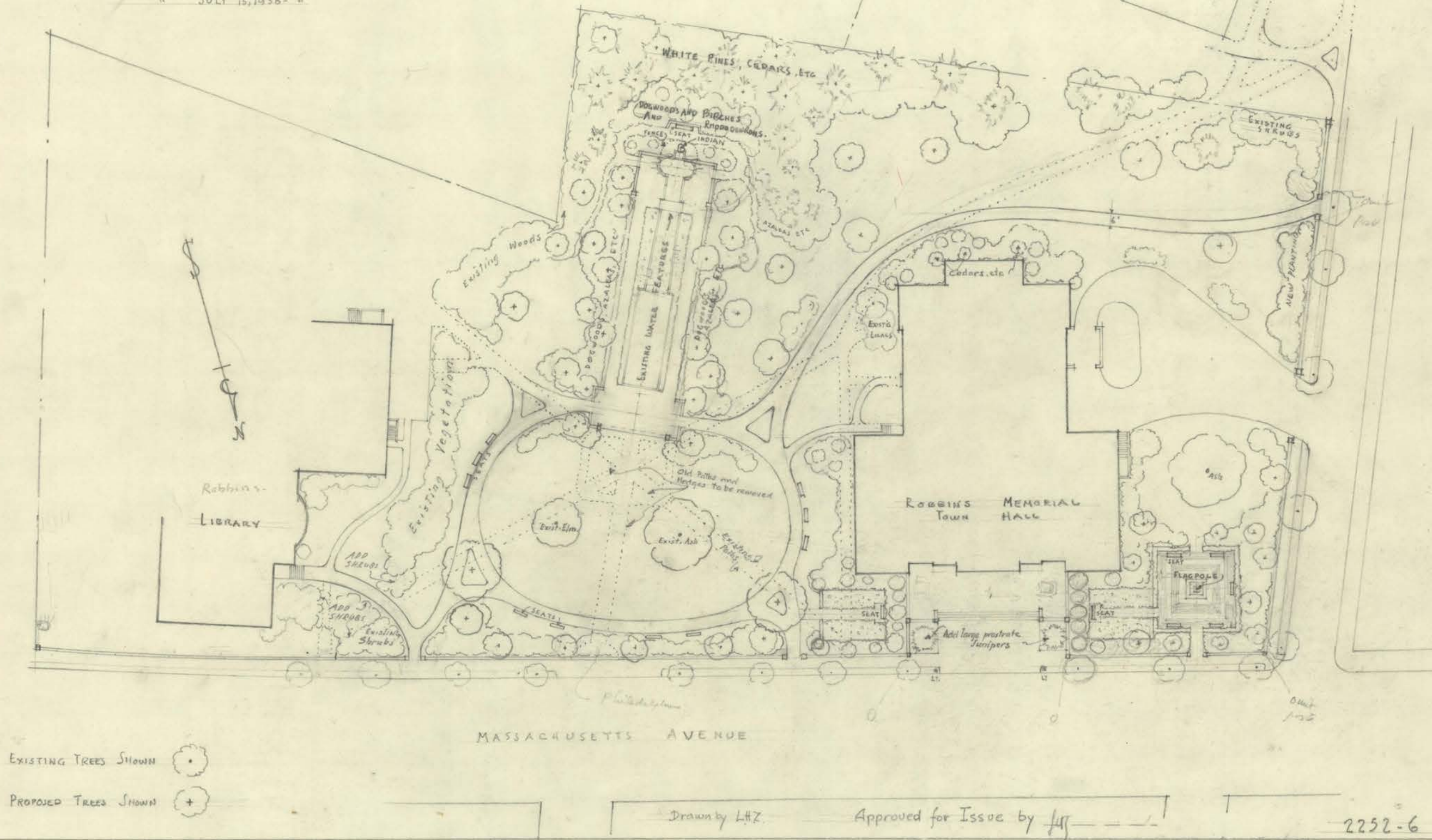
The annual Town Report from 1939 declared the rehabilitated Winfield Robbins Memorial Gardens to be an “informal, woody and rocky environment and a naturalistic planting as a backdrop to the Indian.”

ROBBINS MEMORIAL TOWN HALL  
ARLINGTON, MASS.  
SUGGESTIONS FOR IMPROVING THE GROUNDS  
SCALE 1" = 40'

OLMSTED BROTHERS LANDSCAPE ARCHITECTS  
BROOKLINE, MASS. JUNE 14, 1938

FILE NO 2252- PLAN NO 6

REVISED JULY 14, 1938 - WALKER  
" JULY 15, 1938 - "







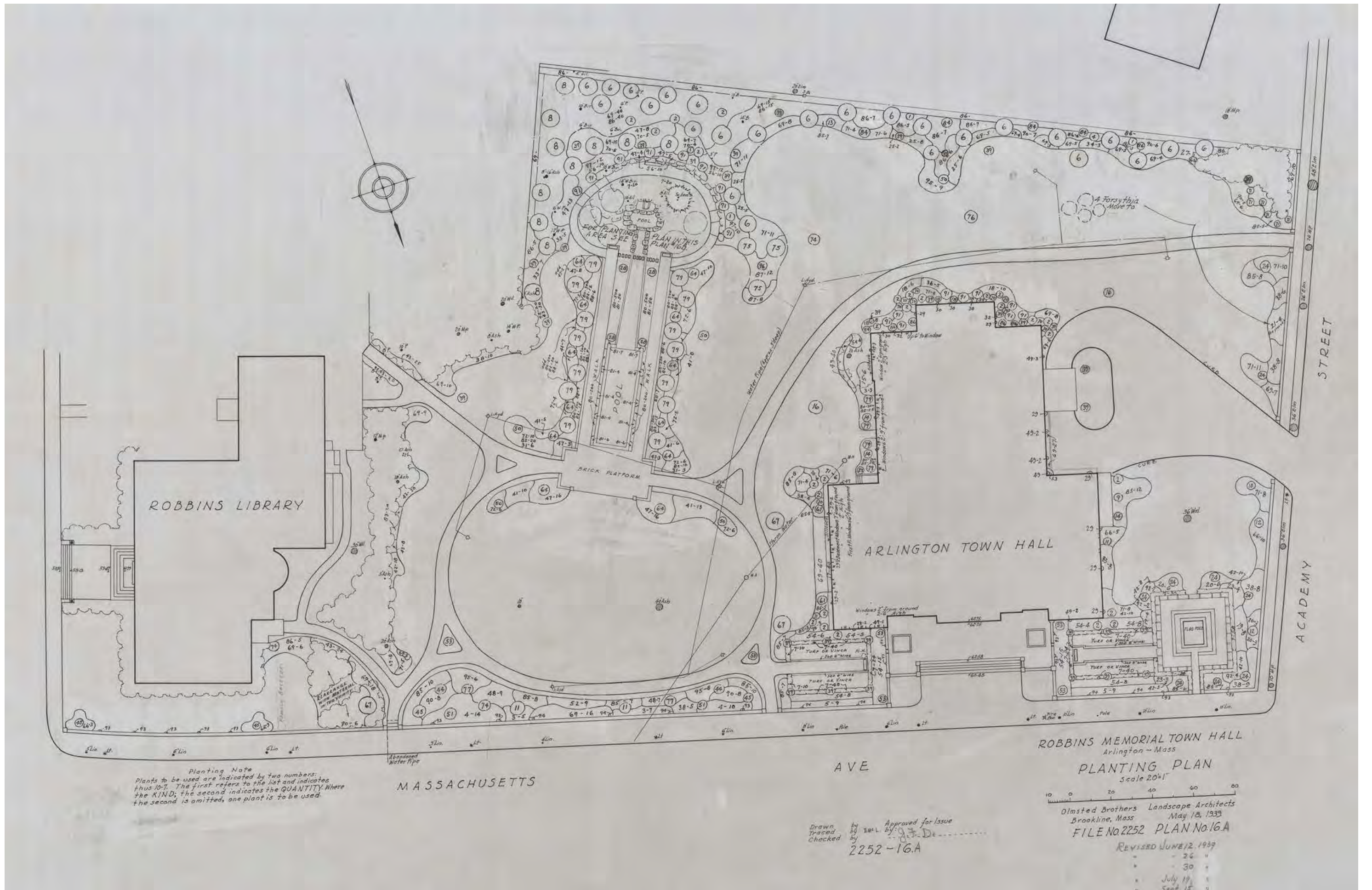
Olmsted Plan No. 8-A, "Suggested Treatment for natural Setting of Bronze Indian", dated July 19, 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS





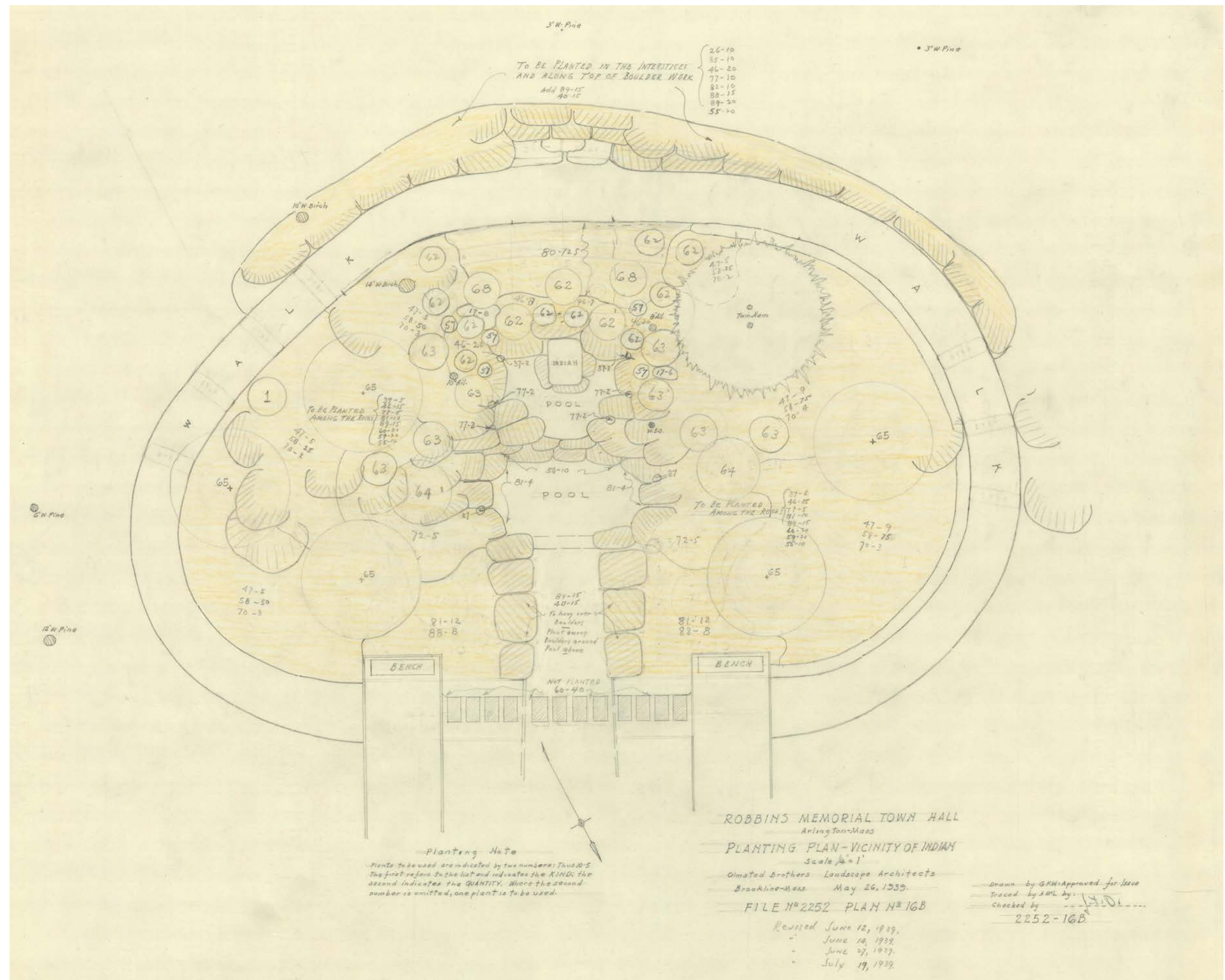
Olmsted Plan No. 8-B, "Suggested Treatment for natural Setting of Bronze Indian", dated July 19, 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS





Olmsted Plan No. 16-A, "Planting Plan", dated May 18, 1938, revised September 15, 1939; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS





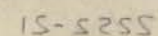
Olmsted Plan No. 16-B, "Planting Plan—Vicinity of Indian", dated May 26, 1939, revised July 19, 1939; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS



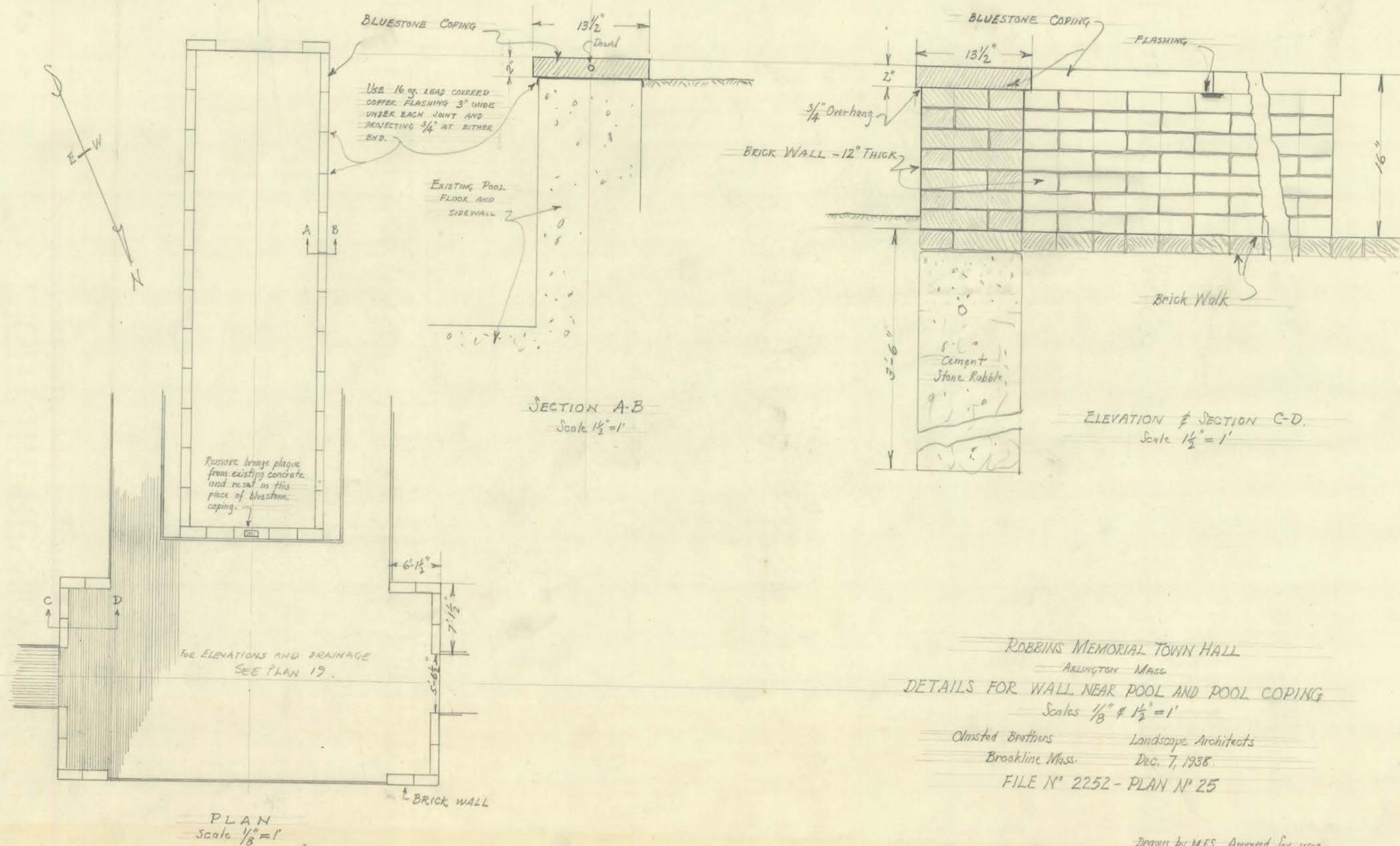




FILE N° 2252 PLAN N° 21.

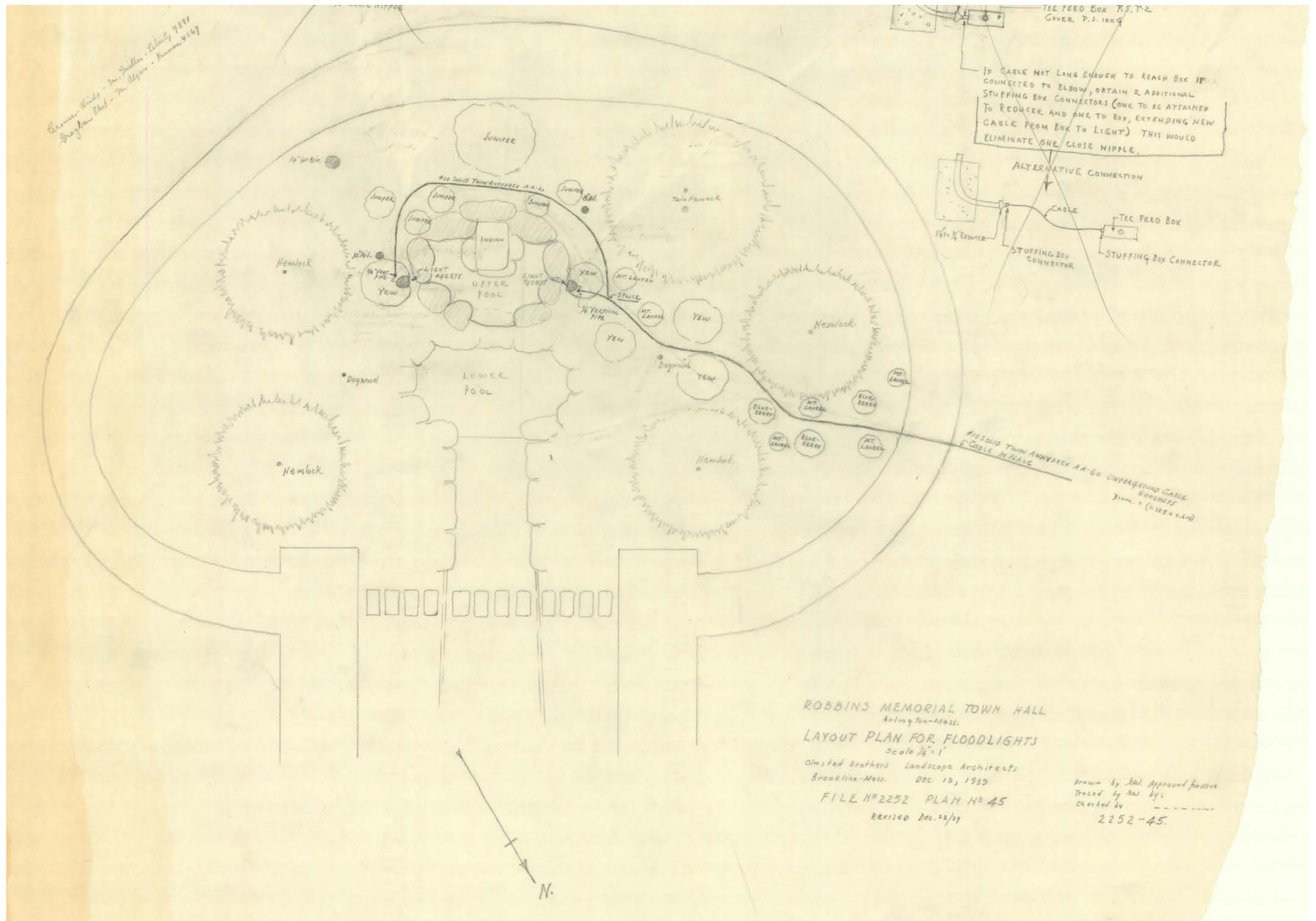






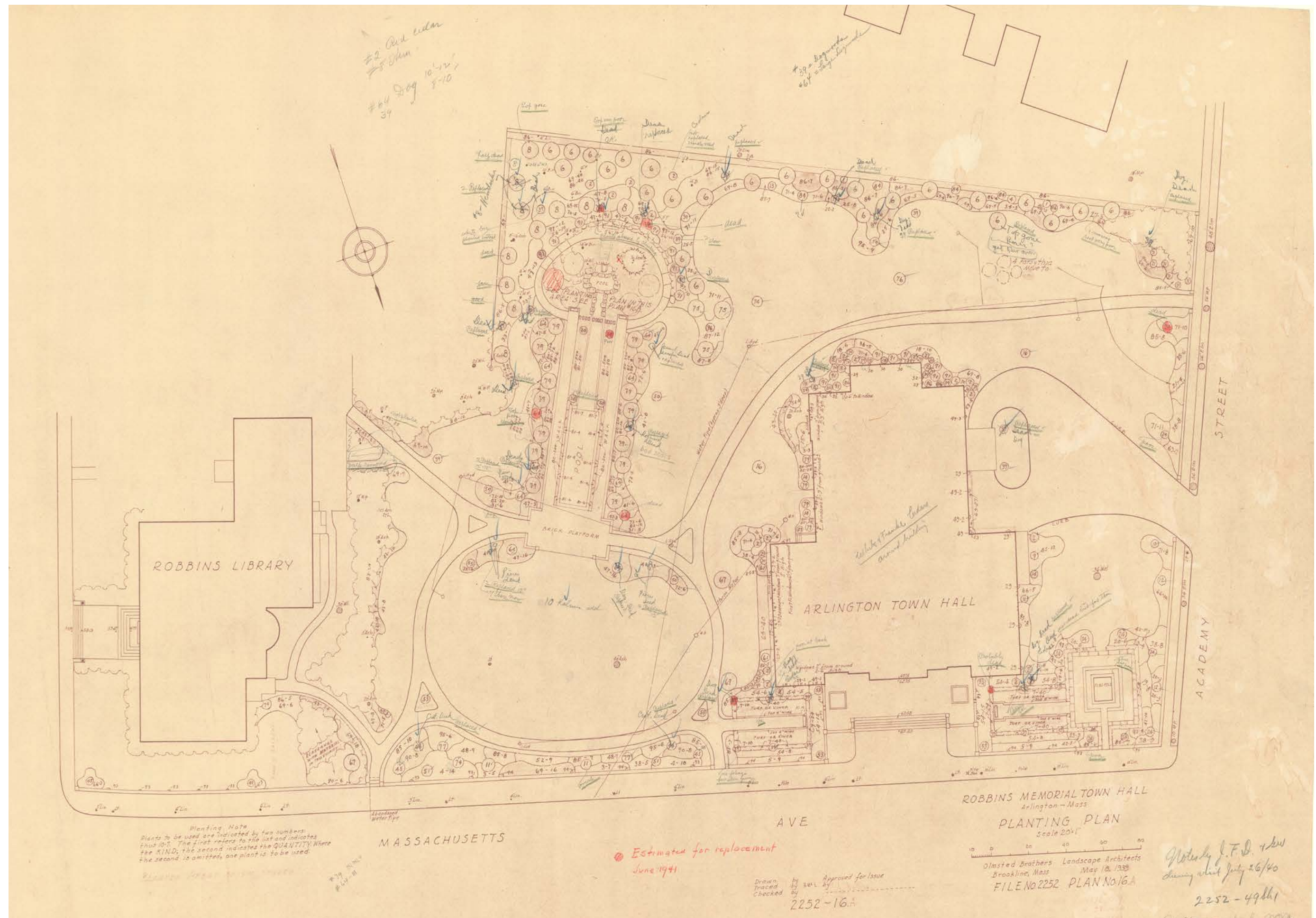






Olmsted Plan No. 45, "Layout Plan for Floodlights", dated December 13, 1939; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS

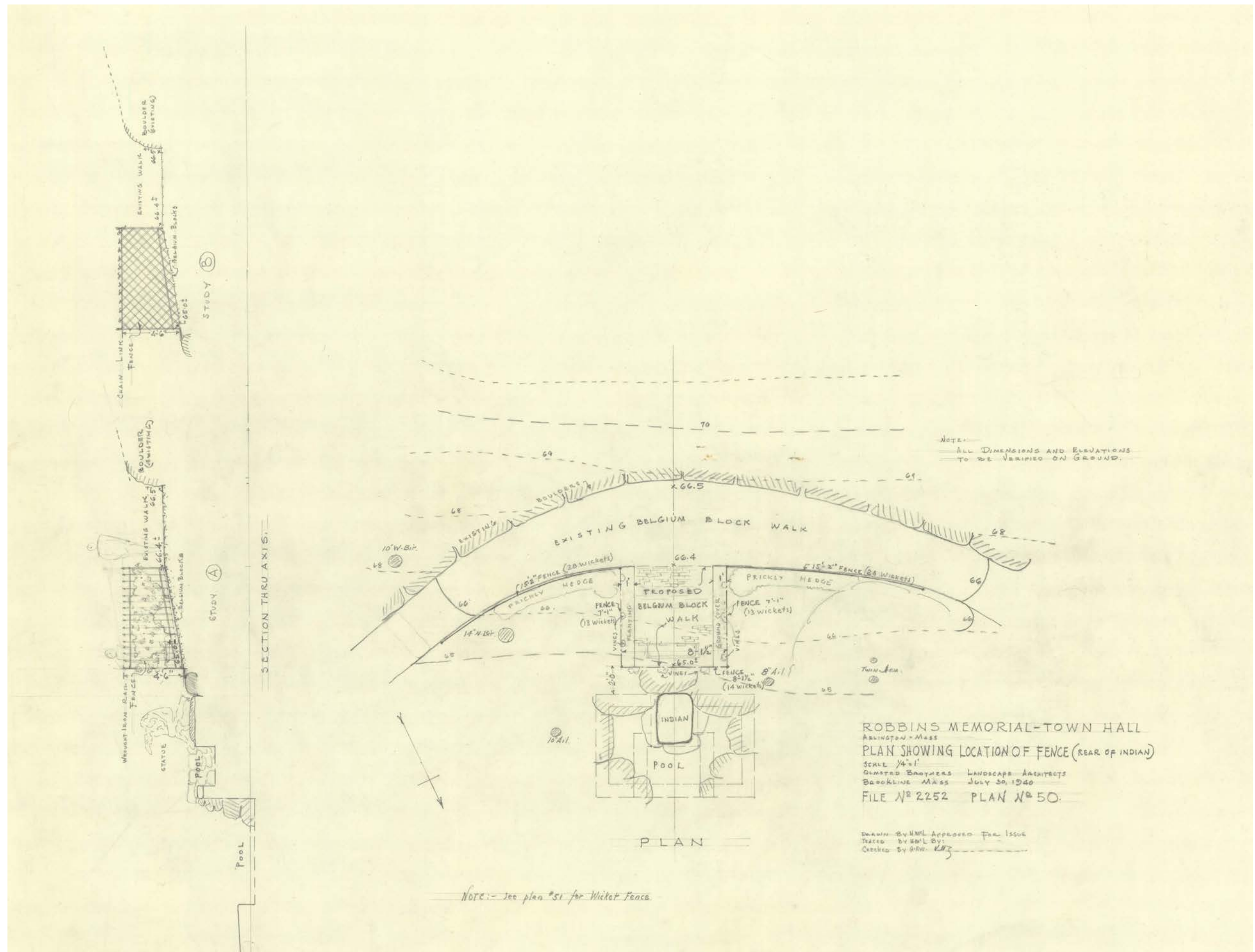




Olmsted Plan No. 49, Sheet 1, Planting plan with "Notes by J.F.D. and G.W. during visit July 26, 1940; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS







Olmsted Plan No. 50, "Plan Showing Location of Fence (Rear of Indian)", dated July 30, 1940; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS







ROBBINS MEMORIAL  
Town Hall  
Arlington, Massachusetts

TO ACCOMPANY PLANS 16A and 16B  
File No. 2252

Olmsted Brothers,  
Landscape Architects.

Brookline, Mass.  
July 1939

1. *Betula papyrifera*  
Canoe Birch
2. *Juniperus virginiana*  
Redcedar
3. *Philadelphus Bouquet Blanc*, 4' apart  
Hybrid Mockorange
4. *Philadelphus coronarius*  
Fragrant Mockorange
5. *Philadelphus Virginal*  
Hybrid Mockorange
6. *Pinus strobus*  
White Pine
7. *Berberis thunbergi*  
Japanese Barberry
8. *Tsuga canadensis*  
Canada Hemlock
9. *Prunus subhirtella*  
Higan Cherry
10. *Prunus subhirtella pendula*  
Weeping Japanese Cherry
11. *Prunus James H. Veitch*  
Japanese Cherry - pink



12. *Prunus Kwanzan*  
Japanese Cherry - bright pink
13. *Prunus Shirofugen*  
Japanese Cherry - light pink
14. *Prunus Amayadori*  
Japanese Cherry - double, white
15. *Viburnum dentatum*  
Arrowwood
16. *Prunus subhirtella autumnalis*  
Autumn-flowering Japanese Cherry
17. Beds, Plants  
*Hemerocallis fulva*  
Tawny Daylily  
*Hemerocallis thunbergi*  
Japanese Daylily
18. *Cotoneaster racemiflora* ~~*sopnagarica*~~  
Cotoneaster *divanata*
19. *Viburnum carlesii*  
Fragrant Viburnum
20. *Deutzia scabra* Pride of Rochester  
Hybrid Deutzia
21. *Forsythia*
22. Beds, Plants  
*Myrica carolinensis*  
Northern Bayberry  
*Rhododendron wilsoni*  
Wilson Rhododendron
23. *Syringa Marie Le Graye*  
Hybrid Lilac - single, white



24. *Prunus Amanogawa*  
Japanese Cherry - pale pink
25. *Rosa spinosissima* in variety  
Scotch Rose
26. *Cotoneaster adpressa*  
Creeping Cotoneaster
27. *Hypericum aureum*  
Golden St. Johnswort
28. *Picea albertiana*  
Alberta Spruce
29. *Hedera helix baltica*  
Baltic Ivy
30. *Euonymus radicans vegetus*  
Bigleaf Wintercreeper
31. *Myrica carolinensis*  
Northern Bayberry
32. *Ampelopsis quinquefolia engelmanni*  
Engelmann Creeper
33. *Rhododendron maximum*  
Rosebay Rhododendron
34. *Rhodotypos kerrioides*  
Jetbead
35. *Cotoneaster horizontalis*  
Rock Cotoneaster
36. *Cotoneaster dielsiana*  
Diels Cotoneaster
37. *Juniperus chinensis sargentii*  
Sargent Juniper
38. *Philadelphus Avalanche*  
Hybrid Mockorange
39. *Cornus florida*  
Flowering Dogwood



40. *Cotoneaster humifusa*  
Bearberry Cotoneaster
41. *Pieris floribunda*  
Mountain Andromeda
42. *Hemerocallis flava*  
Lemon Daylily
43. *Hosta lancifolia*  
Lanceleaf Plantainlily
- 44. *Crataegus nitida*  
Glossy Hawthorn
45. *Crataegus crusgalli*  
Cockspur Thorn
46. *Arctostaphylos uva ursi*  
Bearberry
47. *Kalmia latifolia*  
Mountain Laurel
48. *Philadelphus Mont Blanc*  
Hybrid Mockorange
49. *Hydrangea petiolaris*  
Climbing Hydrangea
50. *Cornus florida rubra*,  
Redflowering Dogwood
51. *Crataegus oxyacantha splendens*  
Paul's Double Scarlet Hawthorn
52. *Deutzia gracilis*  
Slender Deutzia
53. *Syringa japonica*  
Japanese Tree Lilac



54. *Syringa chinensis*  
Chinese Lilac
55. *Nepeta mussini*  
Catmint
56. *Euonymus radicans colorata*  
Wintercreeper
57. *Dirca palustris*  
Leatherwood
58. Beds, Plants, 9" apart
- Dryopteris marginalis*  
Leather Woodfern
- Dryopteris spinulosa*  
Toothed Woodfern
- Polystichum acrostichoides*  
Christmas Fern
- Arisaema triphyllum*  
Jack-in-the-Pulpit
59. Beds, Plants
- Sedum acre*  
Goldmoss
- Sedum sexangulare*  
Hexagon Stonecrop
- Sedum album*  
White Stonecrop
60. Beds, Plants
- Thymus serpyllum album*  
White Thyme
- Thymus serpyllum lanuginosus*  
Woolly Thyme



61. *Malus sargentii*  
Sargent Crab
62. *Juniperus chinensis pfitzeriana*  
Pfitzer Juniper
63. *Taxus cuspidata*, spreading  
Spreading Japanese Yew
64. *Cornus florida*, large specimens  
Flowering Dogwood
65. *Tsuga canadensis*  
Canada Hemlock
66. *Forsythia suspensa*  
Weeping Forsythia
67. *Ulmus americana*  
American Elm
68. *Juniperus virginiana*  
Redcedar
69. *Berberis thunbergii*  
Japanese Barberry
70. *Vaccinium corymbosum*  
Highbush Blueberry
71. *Spiraea van houttei*  
Van Houtte Spiraea
72. *Azalea poukhanensis*  
Korean Azalea
73. *Fagus sylvatica*  
European Beech
- 74. *Malus theifera*  
Tea Crab
75. *Magnolia soulangeana*  
Saucer Magnolia



- 76. *Cladrastris lutea*  
Yellow-wood
77. *Malus arnoldiana*  
Arnold Crab
78. *Vaccinium pennsylvanicum*  
Lowbush Blueberry
79. *Taxus cuspidata brevifolia*  
Dwarf Japanese Yew
80. *Pachysandra terminalis*  
Japanese Pachysandra
81. Beds, Plants
- Cotoneaster adpressa*  
Creeping Cotoneaster
- Cotoneaster horizontalis prostrata*  
Prostrate Cotoneaster
82. Beds, Plants
- Cotoneaster horizontalis*  
Rock Cotoneaster
- Cotoneaster wilsoni*  
Wilson Cotoneaster
83. Iris
84. *Quercus rubra*  
CommonRed Oak
85. *Spiraea thunbergi*  
Thunberg Spirea
86. Privet

Robbins Memorial - 7  
16A & 16B



87. Roses

88. Beds, Plants

*Juniperus chinensis sargentii*  
Sargent Juniper

*Juniperus horizontalis*  
Creeping Juniper

*Juniperus horizontalis douglasii*  
Douglas Juniper

89. *Phlox subulata alba*  
White Moss Phlox

90. *Rosa rugosa*  
Rugosa Rose

91. *Juniperus chinensis pfitzeriana*  
Pfitzer Juniper

92. *Syringa Ludwig Spaeth*,  
Hybrid Lilac - reddish purple, single

93. *Rose Christine Wright*  
Climbing Rose - pink

94. *Rose Dr. Van Fleet*  
Climbing Rose - pink

95. *Cydonia japonica*  
Japanese Flowering Quince

96. *Magnolia stellata*  
Star Magnolia

97. *Cotoneaster dielsiana*  
Diels Cotoneaster

# TOWN HALL GARDEN WATER FEATURES RESTORATION

## 1999 Restoration

No records of work to the garden have been uncovered between 1941 and 1999, with the exception of the Arlington Garden Club and Friends of Robbins Town Gardens volunteer work.

The 1999 restoration was completed in two phases. Phase IA plans are dated April 22, 1998 and were prepared by Pat Loheed Landscape Architect of Somerville, MA. Phase IA included the following (compared against the September 1999 As-built plans):

- Restoration of bronze sculpture, including mortar setting bed under bronze base, and cleaning of concrete and stone, and resetting of stone veneer on concrete plinth
- Resetting of the Olmsted boulders at upper and middle basin, including removal of off-color mortar and cleaning of all stones
- Waterproofing of upper basin and middle basin with liquid membrane
- Removal of old fountain system equipment
- Demolition and reconstruction of the ripple spillway and installation of new spillway curb to depth below grade. Spillway was constructed in three segments with bond breakers
- Resetting of bluestone stepping stones over spillway on mortar setting bed
- Removal of drains in the lower basin at the southwest corner, the northern end, and on the east side in the center
- Skim coating of concrete on base and sides of lower basin
- Installation of drain plugs in upper and middle basins, (3) each with waterproofing
- Installation of a 4" PVC pool drain line running under concrete features through on the center line
- Installation of drain at northern end of lower basin and adjustable overflow drain in northern wall of lower basin
- Installation of sump pit, outlet drain, and overflow drain on west side of where spillway meets lower basin (with memorial manhole cover)
- Installation of concrete vault with filter & chlorinator system
- Installation of new electrical conduit from Town Hall to mechanical vault
- Installation of new copper water connection from Town Hall to mechanical vault
- Replacement of site lighting
- Reproduction benches and installation of concrete pads under the benches

The Department of Environmental Management Contract plans, also prepared by Pat Loheed Landscape Architect (PL/LA), are dated March 18, 1999. These plans include the following work:

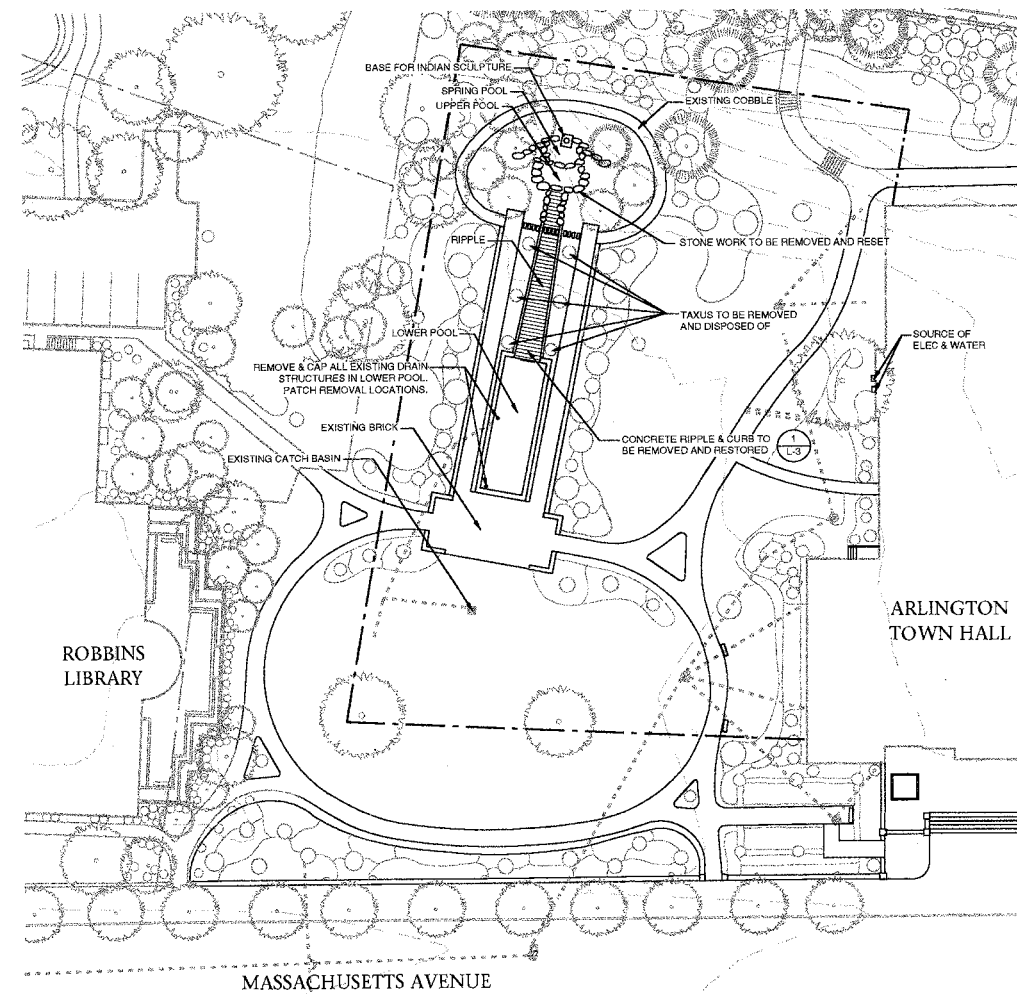
- New dry well and drain at the back of the sculpture (dry well and drain not confirmed/located on as-built plans)
- Resetting of the circular cobble walkway on 3-inch sand/cement setting bed
- Planting changes, including:
  - Replanting of the woodland planting behind the sculpture
  - Removal of all taxus within circular cobblestone walkway
  - Removal of pachysandra and taxus between water feature and brick walkways
  - Removal of dead trees, stumps and additional species in border planting
  - Transplanting of kousa dogwoods (2) to the Whittemore-Robbins House from border planting on east side
- Extensive replanting of all areas around the water features. Tree species include multi-stemmed paper birch, Rutgers University's hybrid dogwoods. The planting palette is heavy with broadleaf evergreens and evergreen groundcovers, including rhododendron, azalea, mountain laurel, sheep laurel, Andromeda, wintercreeper, inkberry, mahonia, pachysandra, and yews. Other species are natives like arrowwood viburnum, and lowbush blueberry.

It appears that much of this planting plan was not undertaken. The replacement Alberta spruces were not planted. (PGA is noted on the plans in the location of existing yews; no PGA is included on the plant schedule.)

- Irrigation plans show a series of zones with 6-inch spray heads within the circular cobblestone walkway, 1/4 and 1/2, and 1/5 arc rotor nozzles immediately outside the circular cobblestone walkway, rotor nozzles through the woodland planting to the east, and a row of 1/2 arc rotor nozzle heads along the border of the Central School Senior Center. A 1-inch PVC main line connects to the backflow preventer in Town Hall.

# WINFIELD ROBBINS MEMORIAL GARDENS HISTORIC RESTORATION PHASE 1-A

## TOWN OF ARLINGTON MASSACHUSETTS



### DRAWINGS:

- L-1 EXISTING CONDITIONS / SITE PREPARATION
- L-2 LAYOUT / UTILITIES
- L-3 POOL LAYOUT / DETAILS
- L-4 FOUNTAIN DIAGRAM / DETAILS
- L-5 FOUNTAIN DETAILS
- L-6 DETAILS FOUNTAIN SYSTEM
- L-7 DETAILS

### LEGEND:

- EXISTING DECIDUOUS TREE
- EXISTING EVERGREEN TREE
- LIMIT OF WORK
- EXISTING DRAIN
- EXISTING CATCH BASIN
- EXISTING DRAIN STRUCTURE



0' 5' 20' 40' 80'

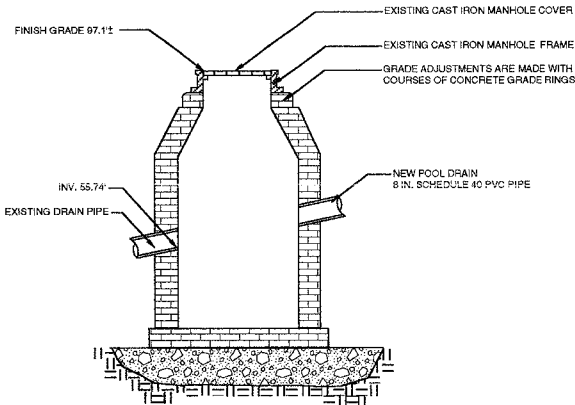
WINFIELD ROBBINS MEMORIAL GARDENS RESTORATION PHASE 1-A			
LANDSCAPE ARCHITECT: <b>PAT LOHEED • LANDSCAPE ARCHITECT</b> 1310 BROADWAY, SUITE 103 SOMERVILLE, MA 02144 617-623-4366 • FAX 617-623-4362			
REVISIONS:	TITLE: <b>EXISTING CONDITIONS / SITE PREPARATION</b>		
DRAWN BY: PL TH CHECKED BY: PL	DATE: 4/22/98	L-1	



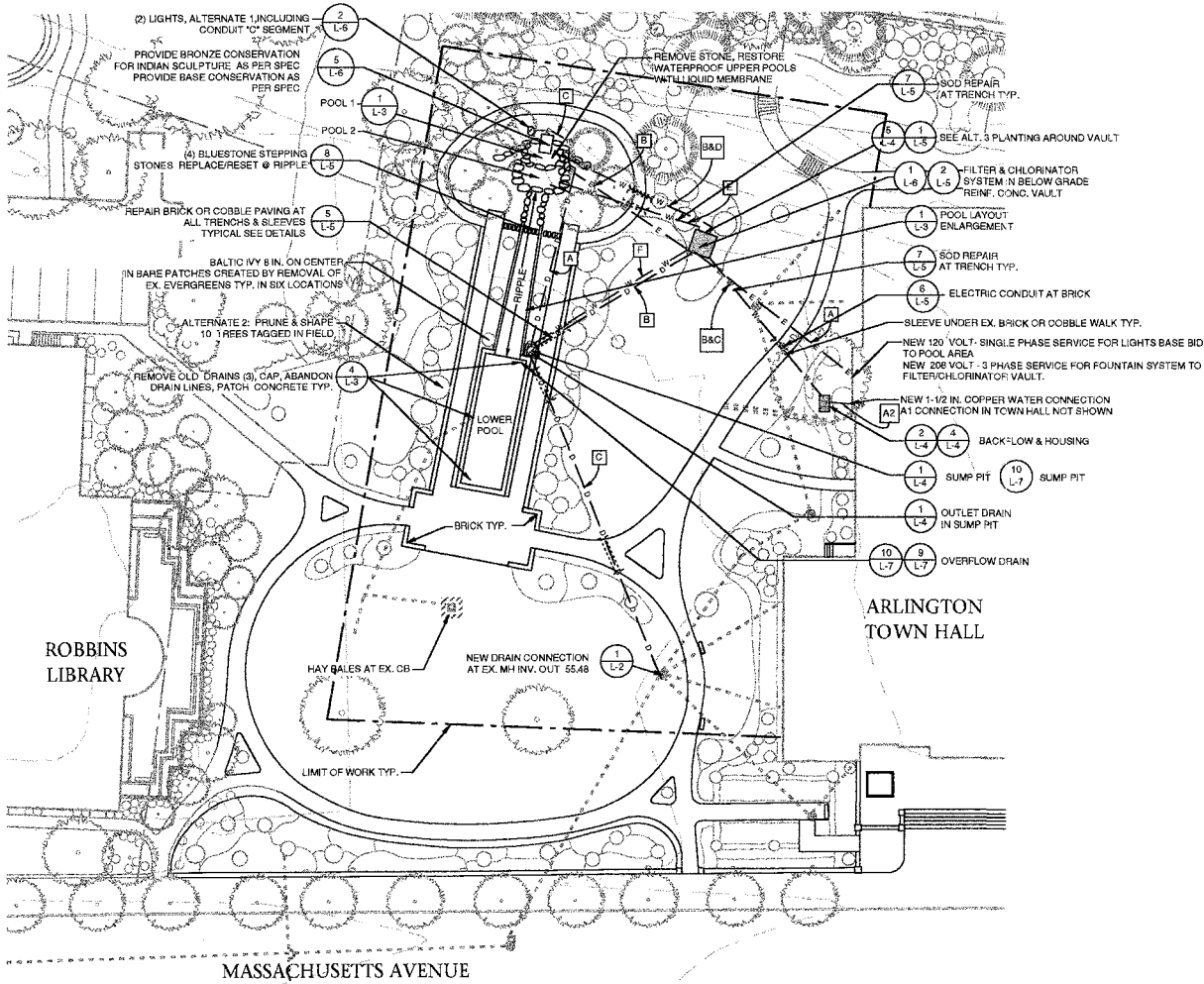
LEGEND:

- EXISTING DECIDUOUS TREE
- EXISTING EVERGREEN TREE
- LIMIT OF WORK
- DRAINAGE STRUCTURES FROM ARLINGTON TOWN ENGINEERS, PLAN & HOWE SURVEY ASSOC., INC.
- EXISTING CATCH BASIN
- EXISTING DRAIN STRUCTURE
- PROPOSED ELECTRICAL
- PROPOSED DRAIN
- PROPOSED WATER
- PROPOSED SLEEVE

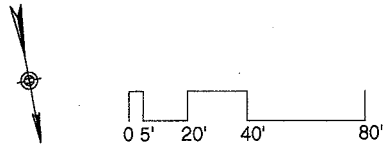
WATER LINES				
RUN*	PIPE	SIZE (DIA.)	LENGTH	NOTES
A-1	COPPER	1-1/2"	NA*	*CONNECT TO EX. @ T. HALL
A-2	COPPER	1-1/2"	12'	TO BACKFLOW
B	PVC SCHED 80	1-1/2"	125LF	WATER MAKEUP TO FILL
C	PVC SCHED 80	1-1/2"	±85 LF	TO FILTER/CHLORINATOR
D	PVC SCHED 80	1-1/2"	±83 LF	TO UPPER POOL #1
E	PVC SCHED 80	1-1/2"	32 LF	TO MIDDLE POOL #2
F-1	PVC SCHED 80	2"	85 LF	TO STRAINER
F-2	PVC SCHED 80	1-1/2"	65 LF	TO FILTER/CHLORINATOR
*LETTERS CORRESPOND TO PLAN L-2, NOT FOUNTAIN DIAGRAM				
DRAIN LINES				
RUN	PIPE	SIZE	LENGTH	INVERTS IN/OUT NOTES
A1	PVC SCHED 40	4"	16LF	FROM POOL #1
A2	PVC SCHED 40	4"	±83 LF	POOL #2 SUMP
B	PVC SCHED 40	4"	±88 LF	VAULT TO SUMP
C	PVC SCHED 40	8"	118 LF	SUMP TO MH
ELECTRICAL				
CONDUIT	SIZE	LENGTH	NOTES	
A1-120V-SINGLE PH	PVC SCHED 80 2"	64LF	BASE BID	
A2-208V-3PH	PVC SCHED 80 2"	64LF	BASE BID	
B-120V	PVC SCHED 80 2"	70LF	BASE BID	
C-120V	PVC SCHED 80 2"	±18LF	ALT. 1	
CONTRACTOR SHOULD VERIFY ALL QUANTITIES, MATERIALS AND CONNECTIONS				



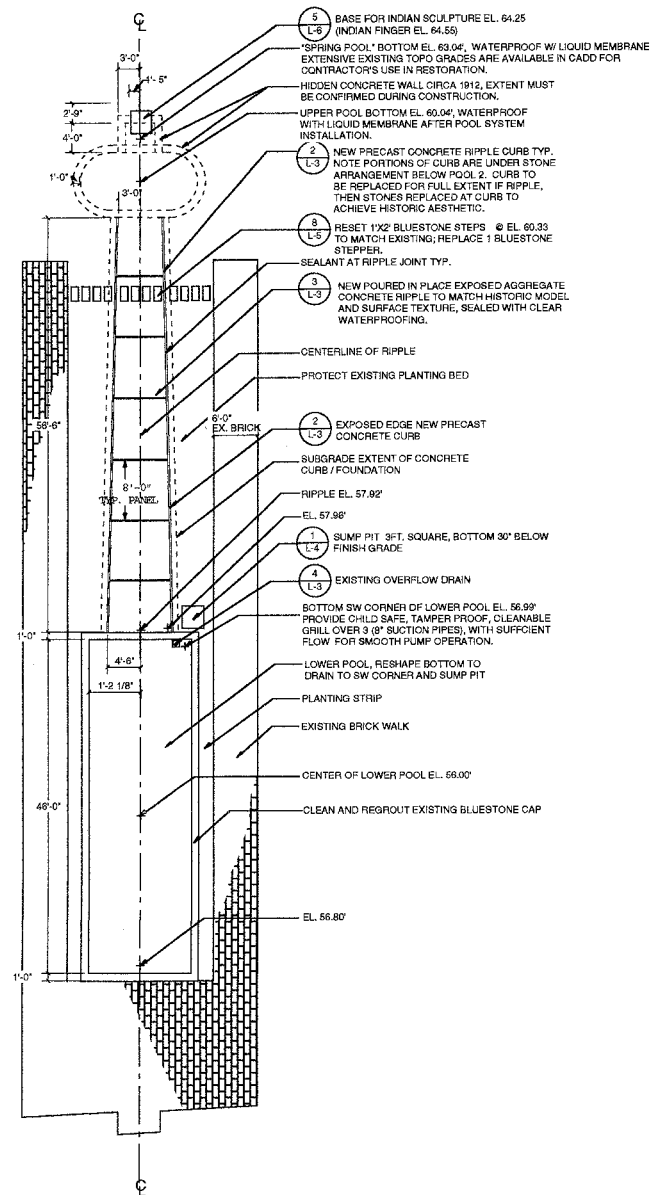
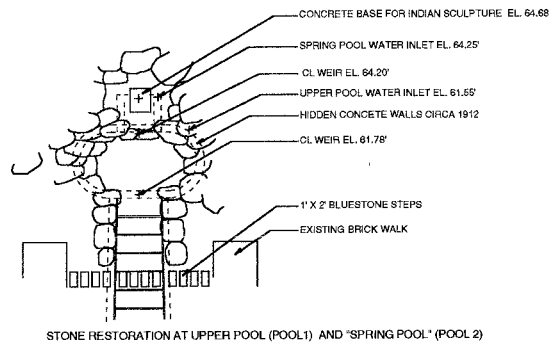
1  
L-2  
DRAIN CONNECTION TO EXISTING STRUCTURE  
SCALE: N.T.S.



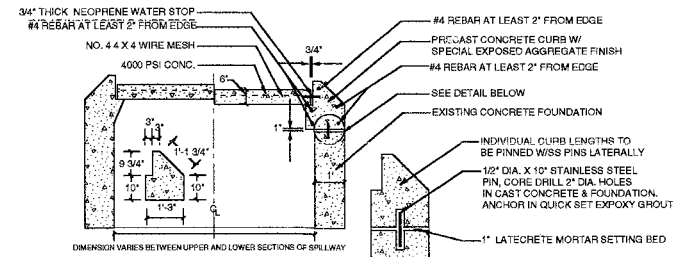
GENERAL LAYOUT PLAN



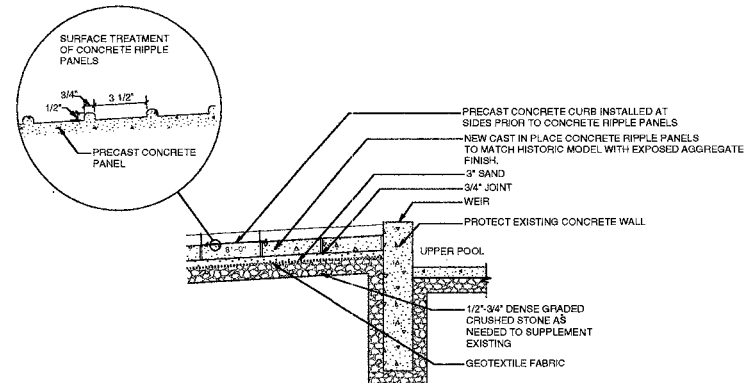
WINFIELD ROBBINS MEMORIAL GARDENS RESTORATION PHASE 1-A	
LANDSCAPE ARCHITECT: PAT LOHEED • LANDSCAPE ARCHITECT 1310 BROADWAY, SUITE 103 SOMERVILLE, MA 02144 617-623-4366 • FAX 617-623-4362	
REVISED:	TITLE: LAYOUT / UTILITIES
DRAWN BY: PL TH CHECKED BY: PL	DATE: 4/22/98 L-2



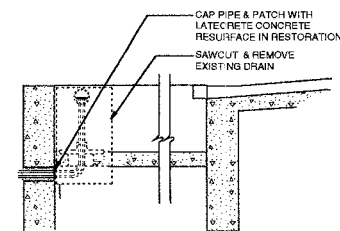
1 POOL LAYOUT  
 SCALE: 1/8" = 1'-0"



2 RIPPLE CURB REPLACEMENT  
 SCALE 1/2" = 1'-0"



3 CONCRETE RIPPLE AT UPPER POOL  
 SCALE: 1/2" = 1'



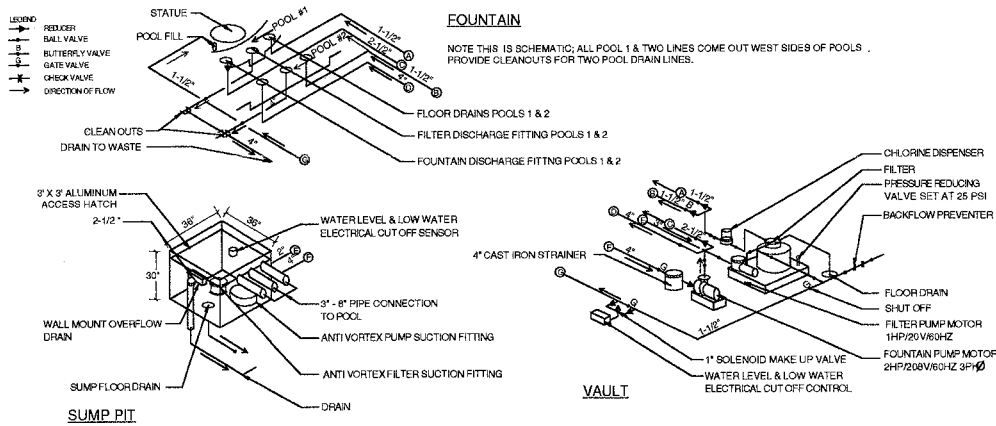
4 EXISTING OVERFLOW DRAIN  
 SCALE: 1/2" = 1'



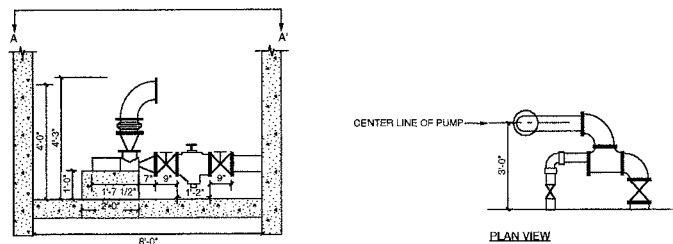
WINFIELD ROBBINS MEMORIAL GARDENS  
 RESTORATION PHASE 1-A

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 PAT LOHEED • LANDSCAPE ARCHITECT  
 1310 BROADWAY, SUITE 103  
 SOMERVILLE, MA 02144  
 617-623-4366 • FAX 617-623-4362

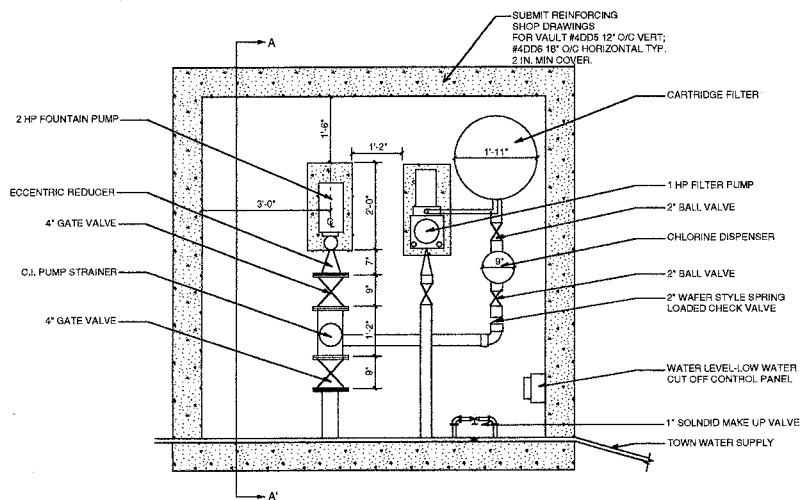
REVISIONS:	TITLE:
	POOL LAYOUT/DETAILS
DRAWN BY/IN CHECK BY: PL	DATE: 4/22/98 L-3



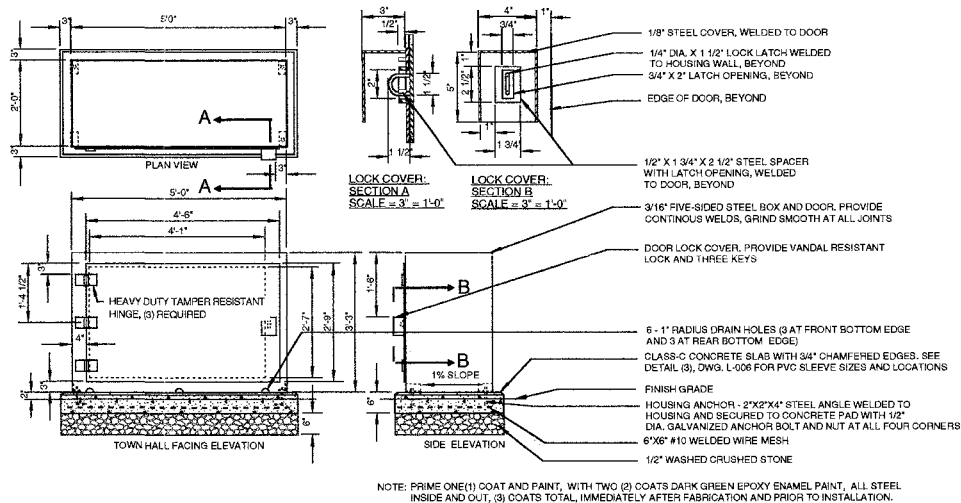
**1 FOUNTAIN SYSTEM DIAGRAM**  
SCALE: N.T.S.



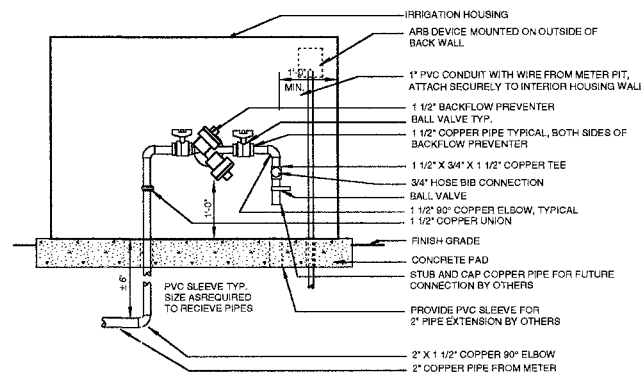
**3 FOUNTAIN PUMP AND PIPING SECTION**  
SCALE: 1/2" = 1'



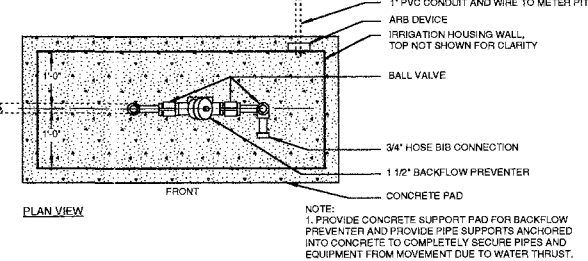
**5 CHLORINATOR/FILTER VAULT PLAN**  
SCALE: 3/4" = 1'



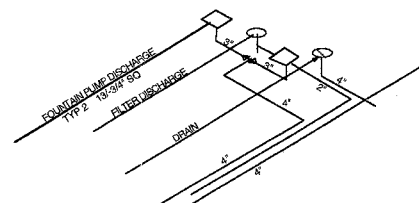
**2 BACKFLOW PREVENTER HOUSING**  
SCALE: 3/4" = 1'



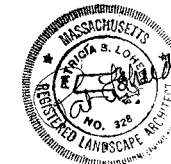
**FRONT ELEVATION/SECTION VIEW**



**4 BACKFLOW PREVENTER**  
SCALE: NTS



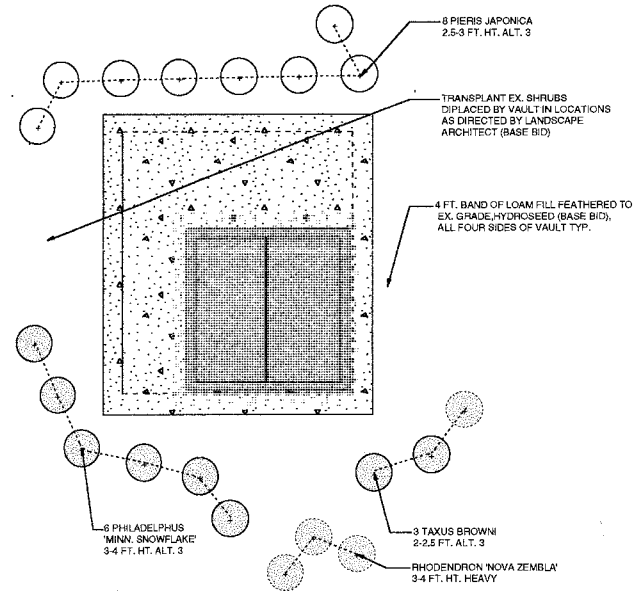
**6 POOL 2 DIAGRAM**  
SCALE: NTS



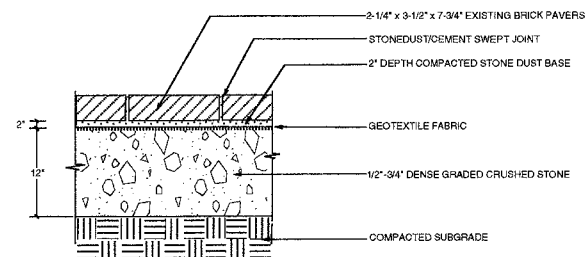
WINFIELD ROBBINS MEMORIAL GARDENS  
RESTORATION PHASE 1-A

LANDSCAPE ARCHITECT:  
**PAT LOHEED • LANDSCAPE ARCHITECT**  
1310 BROADWAY, SUITE 103  
SOMERVILLE, MA 02144  
617-623-4366 • FAX 617-623-4362

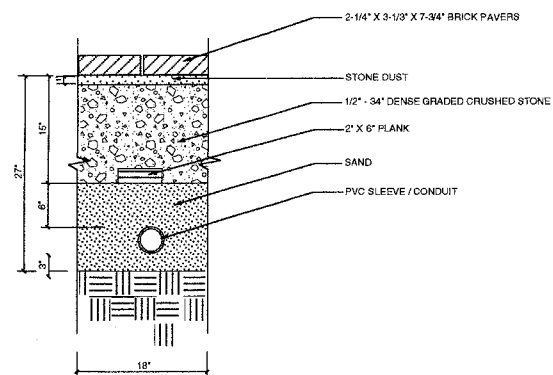
REVISIONS	TITLE
	<b>FOUNTAIN DIAGRAM / DETAILS</b>
DRAWN BY: TH CHECK BY: PL	DATE: 4/22/98 L-4



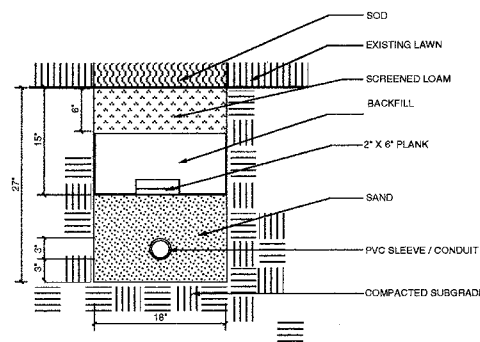
1  
L-5  
**PLAN - BUFFER PLANTING AT FILTER/CHLORINATOR VAULT ALT. 3**  
NTS



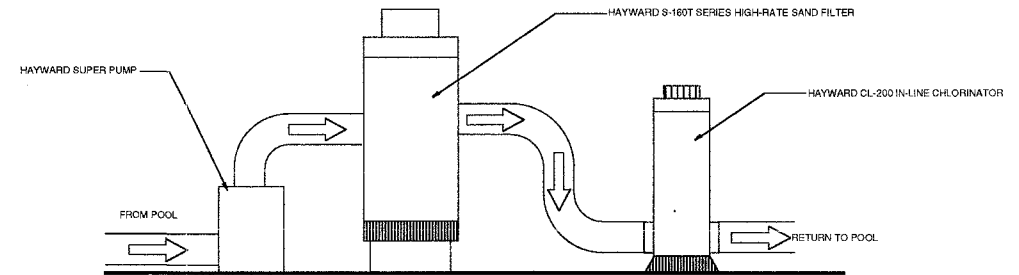
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L-5  
**RESET BRICK PAVERS**  
SCALE: 1-1/2\"/>



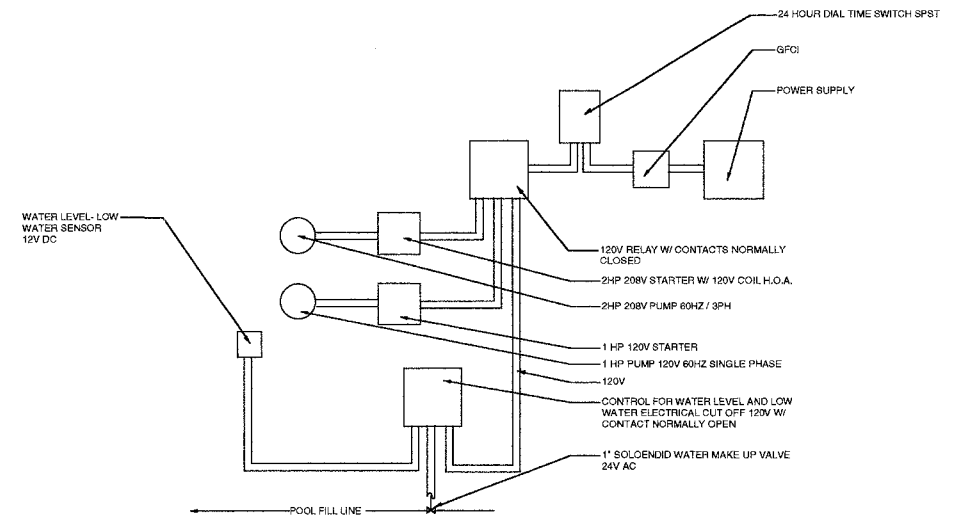
6  
L-5  
**ELECTRIC CONDUIT BENEATH BRICK**  
SCALE: 1-1/2\"/>



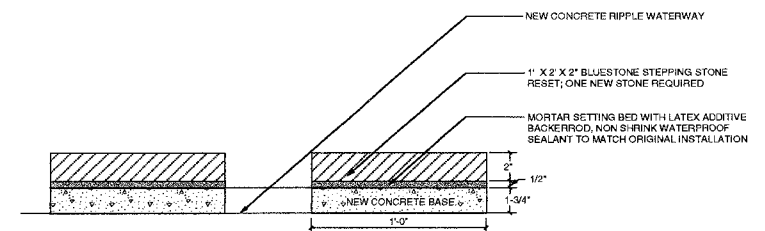
7  
L-5  
**SOD AT TRENCH & ELECTRIC CONDUIT**  
SCALE: 1-1/2\"/>



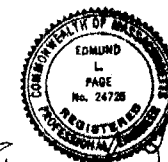
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L-5  
**IN-LINE CHLORINATOR INSTALLATION**  
SCALE: N.T.S.



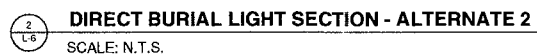
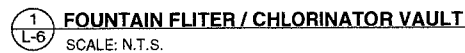
4  
L-5  
**ELECTRICAL SCHEMATIC**  
SCALE: N.T.S.



8  
L-5  
**RAISED BLUESTONE STEPPERS**  
SCALE: 3\"/>



WINFIELD ROBBINS MEMORIAL GARDENS RESTORATION PHASE 1-A			
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617-623-4366 • FAX 617-623-4362			
REVISIONS:	TITLE:		
	FOUNTAIN DETAILS		
DRAWN BY: TH	DATE:	4/22/98	L-5
CHECK BY: PL			



TYPICAL AREAS OF RESTORATION FOR BOTH POOL 1 AND POOL 2  
(AREAS OF INAPPROPRIATE MORTAR COLOR  
OR INSTALLATION TECHNIQUE) REMOVE STONE,  
NUMBER STOCKPILE, CLEAN, RESET ACCORDING  
TO PLAN APPROVED BY LANDSCAPE ARCHITECT  
& PRESERVATION CONSULTANT

TYPICAL AREAS OF RESTORATION FOR BOTH POOL 1 AND POOL 2  
(AREAS OF INAPPROPRIATE MORTAR COLOR  
OR INSTALLATION TECHNIQUE) REMOVE STONE,  
NUMBER STOCKPILE, CLEAN, RESET ACCORDING  
TO PLAN APPROVED BY LANDSCAPE ARCHITECT  
& PRESERVATION CONSULTANT

— REMOVE EXISTING FOUNTAIN  
EQUIPMENT AND DISPOSE OF



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 SOMERVILLE, MA 02144  
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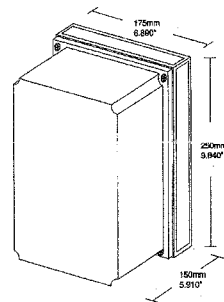
DRAWN BY: TH CHECK BY: PL	DATE: 4/22/98	L-6
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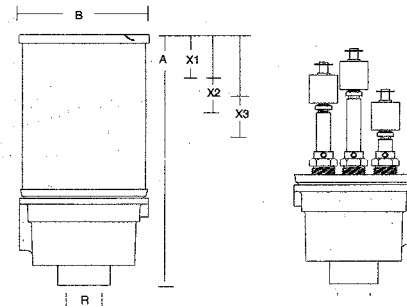
4  
1-6

**STONE / INDIAN SCULPTURE RESTORATION**

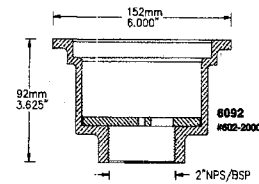
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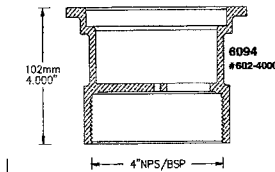
1 CONTROL PANEL WITH TRANSFORMER  
SCALE: NTS



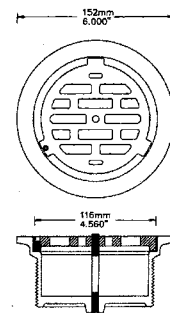
2 CONDUIT MOUNTED SENSOR  
SCALE: NTS



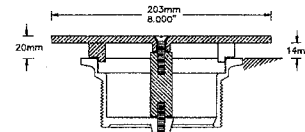
3 FILTER RETURN BASE  
SCALE: NTS



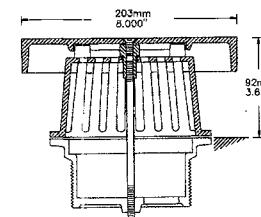
4 4" DRAIN BASE  
SCALE: NTS



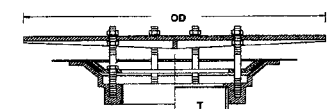
5 4" SURFACE DRAIN  
SCALE: NTS



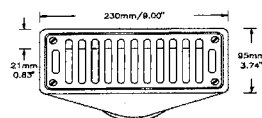
6 DISCHARGE FITTING  
SCALE: NTS



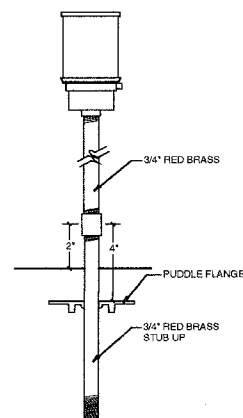
7 ANTI-VORTEX SUCTION FITTING/FILTER  
SCALE: NTS



8 VALVED ANTI-VORTEX SUCTION FITTING  
SCALE: NTS

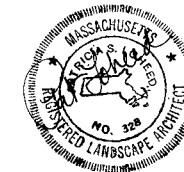


9 ADJUSTABLE WALL OVERFLOW  
SCALE: NTS



10 SENSOR  
SCALE: NTS

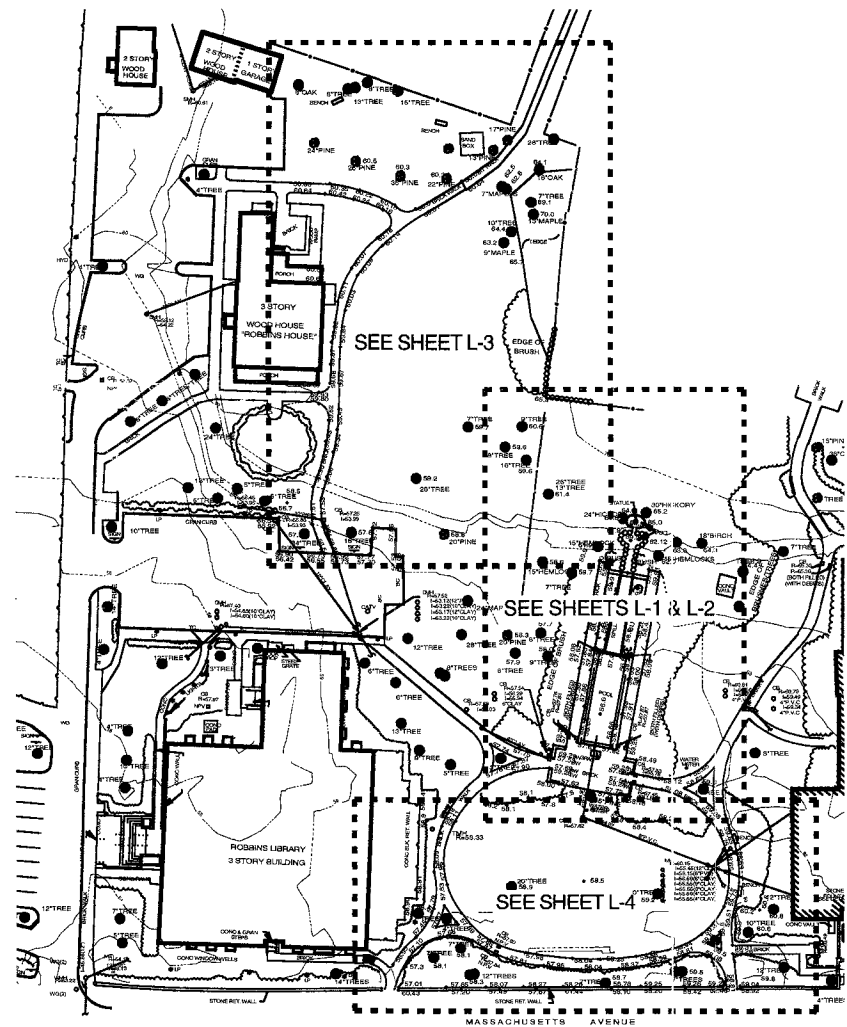
POOL SYSTEM SCHEDULE KEY	COMPONENT	MANUFACTURER/MODEL#	SPECIFICATION NUMBER
1	CONTROL PANEL WITH TRANSFORMER	PEM-L-104-100-42-EV-103	2.07
2	CONDUIT MOUNTED SENSOR	PEM-L-104-100-42-EV-103	2.07
3	FILTER RETURN BASE	PEM-6092-4-6216	2.10
4	4" DRAIN BASE	PEM-6094-4-6217	2.08 & 2.09
5	4" SURFACE DRAIN	PEM-6212	2.12
6	DISCHARGE FITTING	PEM-6092-4-6215	2.13
7	ANTI-VORTEX SUCTION FITTING/FILTER	PEM-6092-4-6216	2.09
8	VALVED ANTI-VORTEX SUCTION FITTING	PEM-6443-0072	2.14
9	ADJUSTABLE WALL OVERFLOW	6317-60-1	2.11
10	SENSOR	PEM-L-104-100-42-EV-103	2.07
	FOUNTAIN PUMP	ITT BELL & GOSSET 4AC	2.03
	PUMP STRAINER	HAYWORD MODEL 30	2.04
	FILTER	HAYWORD C-3000	2.05
	CHLORINE DISPENSER	HAYWORD CL-200-2S	2.06



WINFIELD ROBBINS MEMORIAL GARDENS RESTORATION PHASE 1-A			
LANDSCAPE ARCHITECT: PAT LOHEED • LANDSCAPE ARCHITECT 1310 BROADWAY, SUITE 103 SOMERVILLE, MA 02144 617-623-4366 • FAX 617-623-4362			
REVISIONS:	TITLE: FOUNTAIN SYSTEM DETAILS		
DRAWN BY: TIL CHECK BY: J.L.	DATE: 4/22/98	L-7	

TOWN HALL GARDENS  
HISTORIC RESTORATION  
DEM CONTRACT

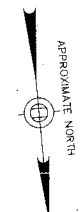
TOWN OF ARLINGTON  
MASSACHUSETTS



DRAWINGS:

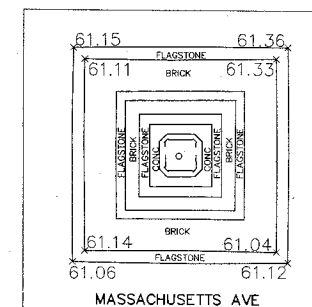
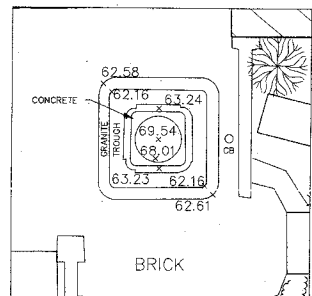
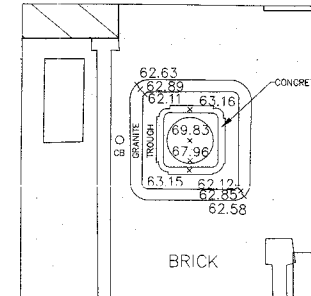
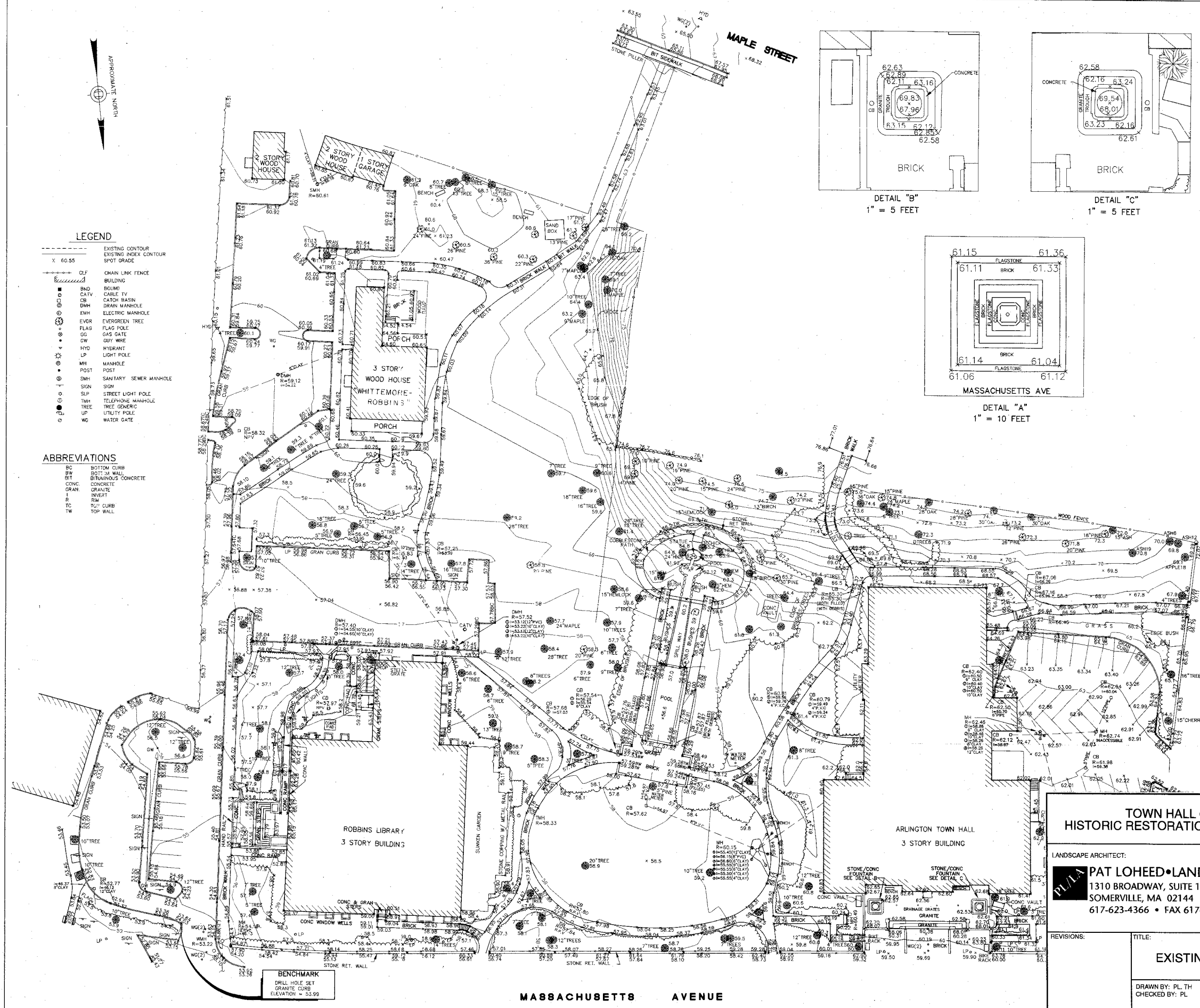
- EX EXISTING CONDITIONS
- L-1 AREA A - DEMO PLAN
- L-2 AREA A - PLANTING PLAN
- L-3 AREA B - PLANTING PLAN
- L-4 AREA C - PLANTING PLAN
- L-5 AREA A - IRRIGATION PLAN

TOWN HALL GARDENS HISTORIC RESTORATION - DEM CONTRACT			
LANDSCAPE ARCHITECT: PAT LOHEED • LANDSCAPE ARCHITECT 1310 BROADWAY, SUITE 103 SOMERVILLE, MA 02144 617-623-4366 • FAX 617-623-4362			
REVISIONS:		TITLE: EXISTING CONDITIONS	
DRAWN BY: PL, JR CHECKED BY: PL		DATE: 3/18/99	EX



- LEGEND**
- EXISTING CONTOUR
  - EXISTING INDEX CONTOUR
  - SPOT GRADE
  - CLF CHAIN LINK FENCE
  - BND BOUND
  - CATV CATCH BASIN
  - DMH DRAIN MANHOLE
  - EMH ELECTRIC MANHOLE
  - EVER EVERGREEN TREE
  - FLAG FLAG POLE
  - GW GAS GATE
  - GW GUY WIRE
  - HYD HYDRANT
  - LP LIGHT POLE
  - MANHOLE
  - POST
  - SMH SANITARY SEWER MANHOLE
  - SIGN
  - SLP STREET LIGHT POLE
  - TWH TELEPHONE MANHOLE
  - TREE TREE
  - UP UTILITY POLE
  - WG WATER GATE

- ABBREVIATIONS**
- BC BOTTOM CURB
  - BT BOTTOM WALL
  - CONC CONCRETE
  - GRAN GRANITE
  - INVERT
  - TC TYPICAL
  - TW TOP WALL



**HOWE SURVEYING ASSOCIATES, INC.**  
CIVIL ENGINEERS & LAND SURVEYORS

73 PRINCETON STREET  
NO. CHELMSFORD, MA. 01863  
(978) 251-3132  
43 BUENA VISTA STREET  
DEVENS, MA. 01432  
(978) 772-1200

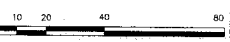


**EXISTING CONDITIONS**  
WINFIELD ROBBINS GARDENS

**MASSACHUSETTS**  
ARLINGTON, MA

PREPARED FOR:  
PAT LOHEED LANDSCAPE ARCHITECT  
1310 BROADWAY STREET  
SOMERVILLE, MA  
617-623-4366

DATE	REVISION	BY



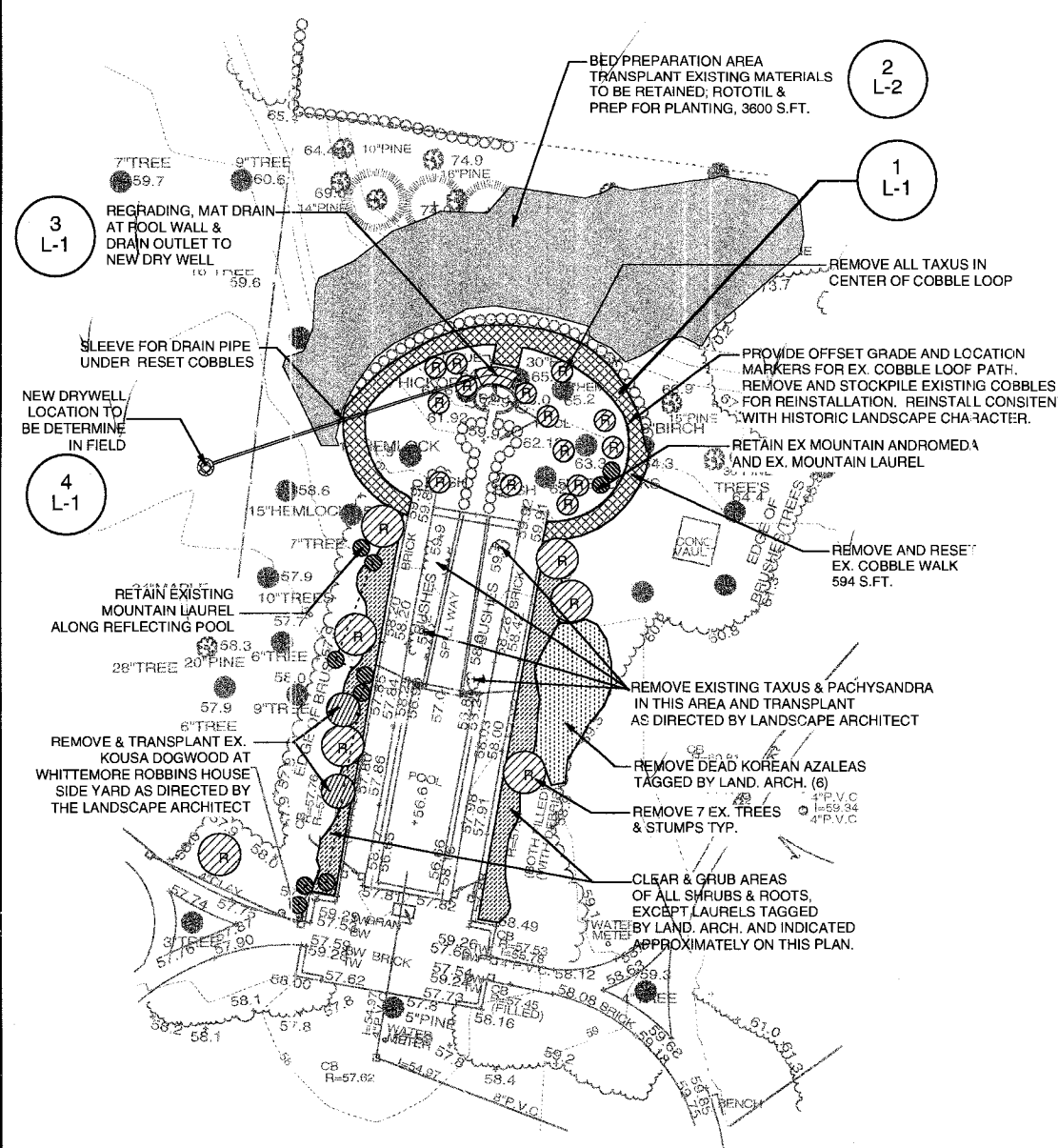
**TOWN HALL GARDENS  
HISTORIC RESTORATION - DEM CONTRACT**

LANDSCAPE ARCHITECT:  
**PAT LOHEED • LANDSCAPE ARCHITECT**  
1310 BROADWAY, SUITE 103  
SOMERVILLE, MA 02144  
617-623-4366 • FAX 617-623-4362

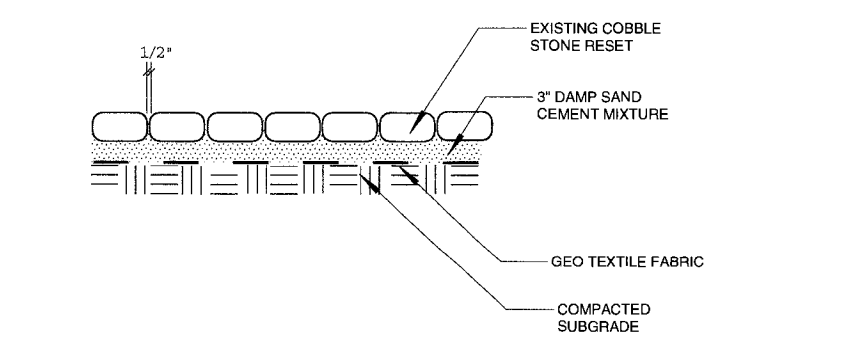
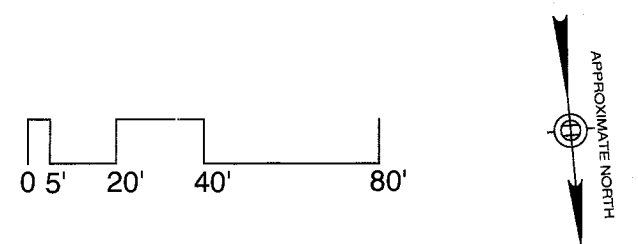
REVISIONS:	TITLE:
	<b>EXISTING CONDITIONS</b>
DRAWN BY: PL TH CHECKED BY: PL	DATE: 3/18/99 <b>EX</b>

Use of this plan is limited to the project and site shown. It is not to be used for any other purpose without the written consent of the author.

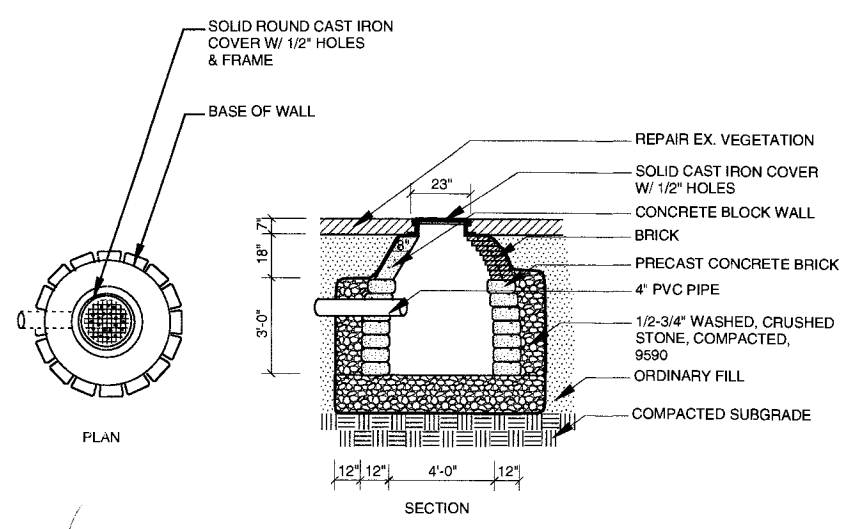




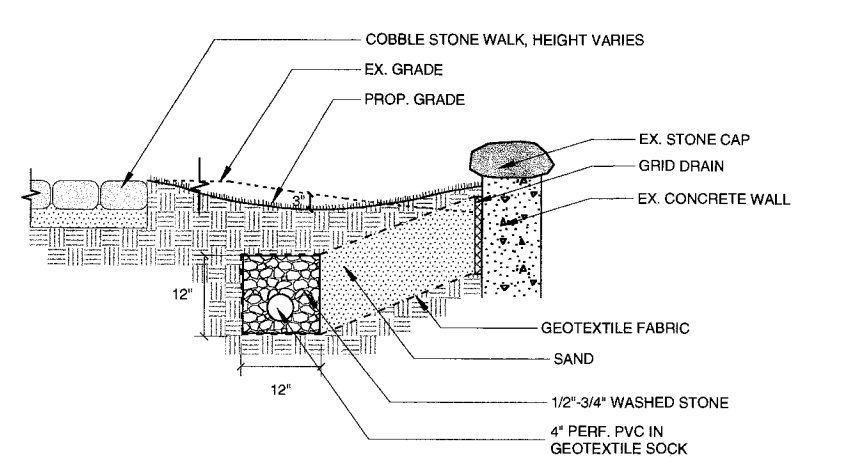
REMOVALS & DRAINAGE AREA A PLAN



1 L-1 COBBLE LOOP WALK  
SCALE: 3/4"=1'



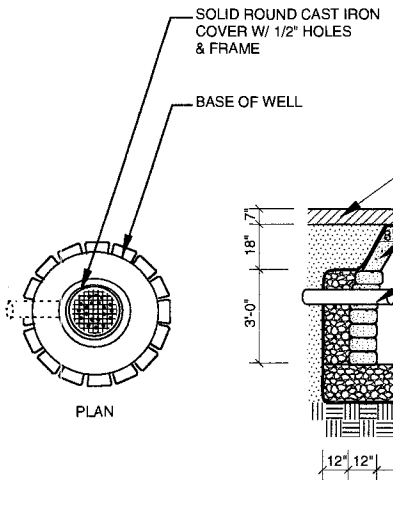
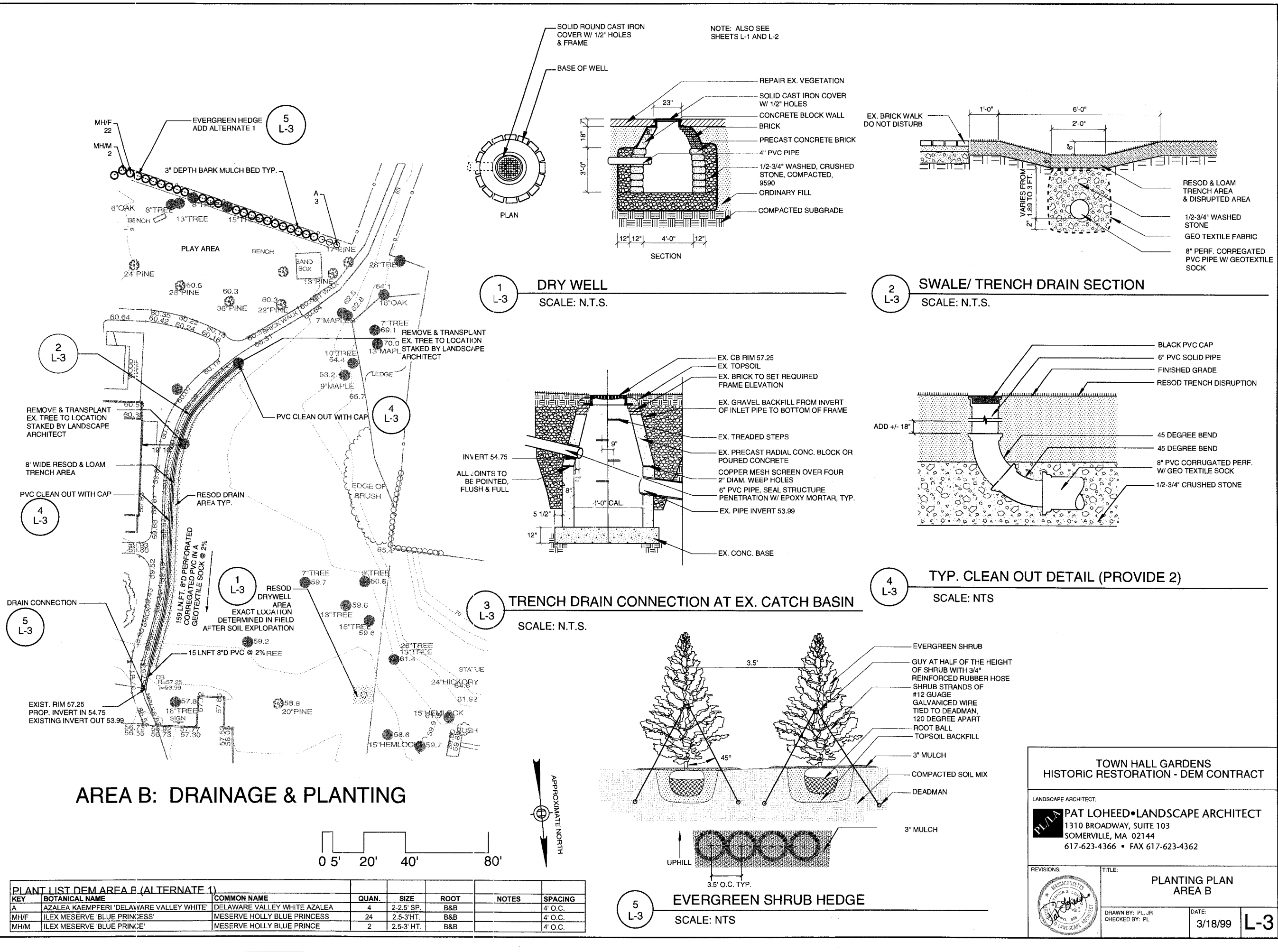
3 L-1 DRY WELL  
SCALE: N.T.S.



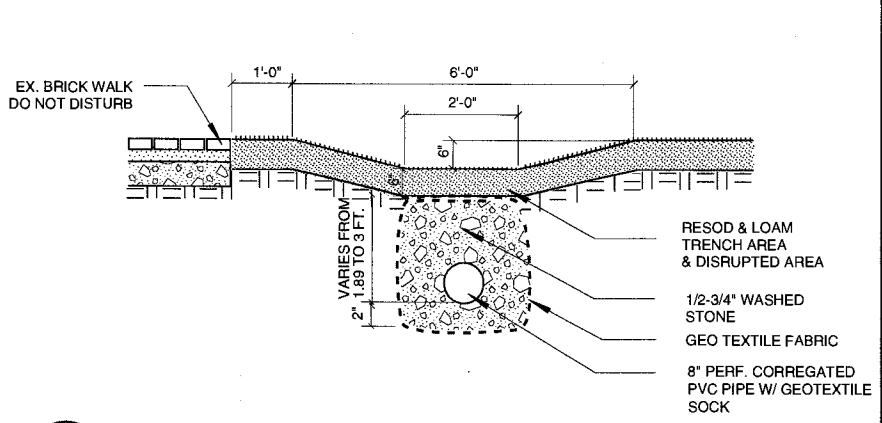
4 L-1 DRAIN AT BACK OF POOL  
SCALE: N.T.S.

<p align="center"><b>TOWN HALL GARDENS HISTORIC RESTORATION - DEM CONTRACT</b></p>			
<p>LANDSCAPE ARCHITECT:   <b>PAT LOHEED • LANDSCAPE ARCHITECT</b>          1310 BROADWAY, SUITE 103          SOMERVILLE, MA 02144          617-623-4366 • FAX 617-623-4362</p>			
<p>REVISIONS:</p> 	<p>TITLE:  <b>DEMOLITION AND SITE PREPARATION AREA A</b></p>	<p>DRAWN BY: PL JR          CHECKED BY: PL</p>	<p>DATE:          3/18/99</p>
			<p><b>L-1</b></p>

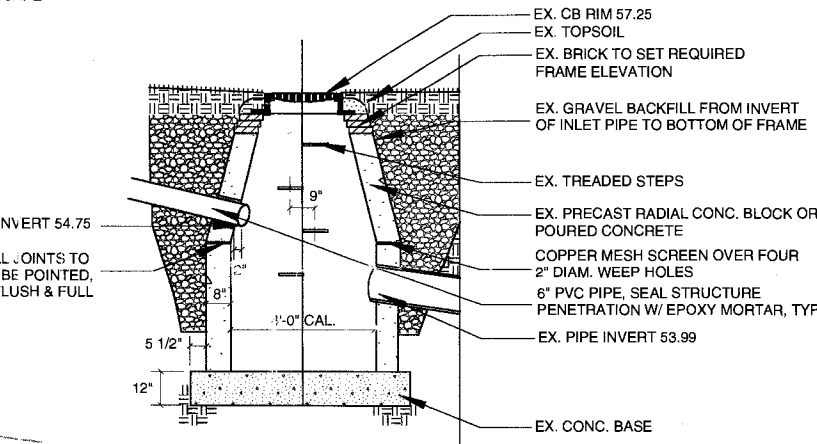
L-2



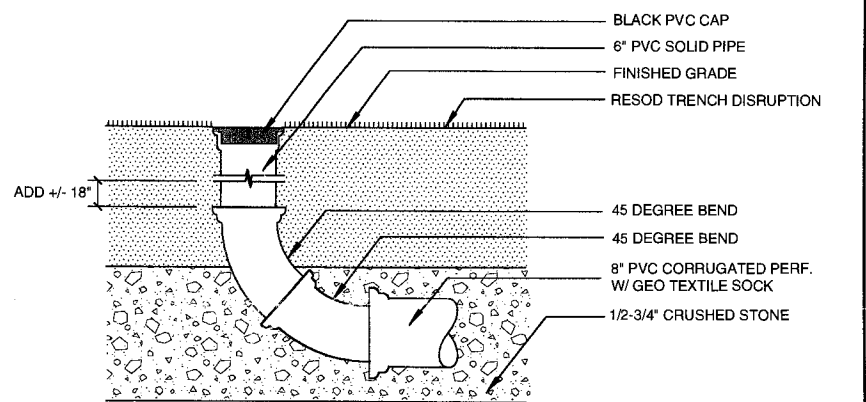
1 L-3 DRY WELL  
SCALE: N.T.S.



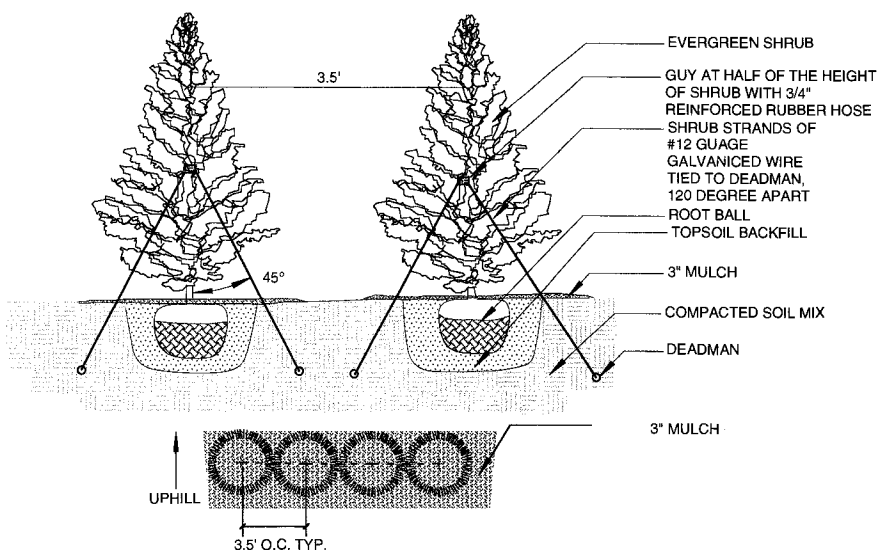
2 L-3 SWALE/ TRENCH DRAIN SECTION  
SCALE: N.T.S.



3 L-3 TRENCH DRAIN CONNECTION AT EX. CATCH BASIN  
SCALE: N.T.S.



4 L-3 TYP. CLEAN OUT DETAIL (PROVIDE 2)  
SCALE: N.T.S.



5 L-3 EVERGREEN SHRUB HEDGE  
SCALE: N.T.S.

AREA B: DRAINAGE & PLANTING

PLANT LIST DEM AREA B (ALTERNATE 1)						
KEY	BOTANICAL NAME	COMMON NAME	QUAN.	SIZE	ROOT	SPACING
A	AZALEA KAEMPFERI 'DELAWARE VALLEY WHITE'	DELAWARE VALLEY WHITE AZALEA	4	2-2.5' SP.	B&B	4' O.C.
MH/F	ILEX MESERVE 'BLUE PRINCESS'	MESERVE HOLLY BLUE PRINCESS	24	2.5-3' HT.	B&B	4' O.C.
MH/M	ILEX MESERVE 'BLUE PRINCE'	MESERVE HOLLY BLUE PRINCE	2	2.5-3' HT.	B&B	4' O.C.

TOWN HALL GARDENS  
HISTORIC RESTORATION - DEM CONTRACT

LANDSCAPE ARCHITECT:  
**PL/LA PAT LOHEED • LANDSCAPE ARCHITECT**  
1310 BROADWAY, SUITE 103  
SOMERVILLE, MA 02144  
617-623-4366 • FAX 617-623-4362

REVISIONS:

TITLE: **PLANTING PLAN AREA B**

DRAWN BY: PL JR  
CHECKED BY: PL

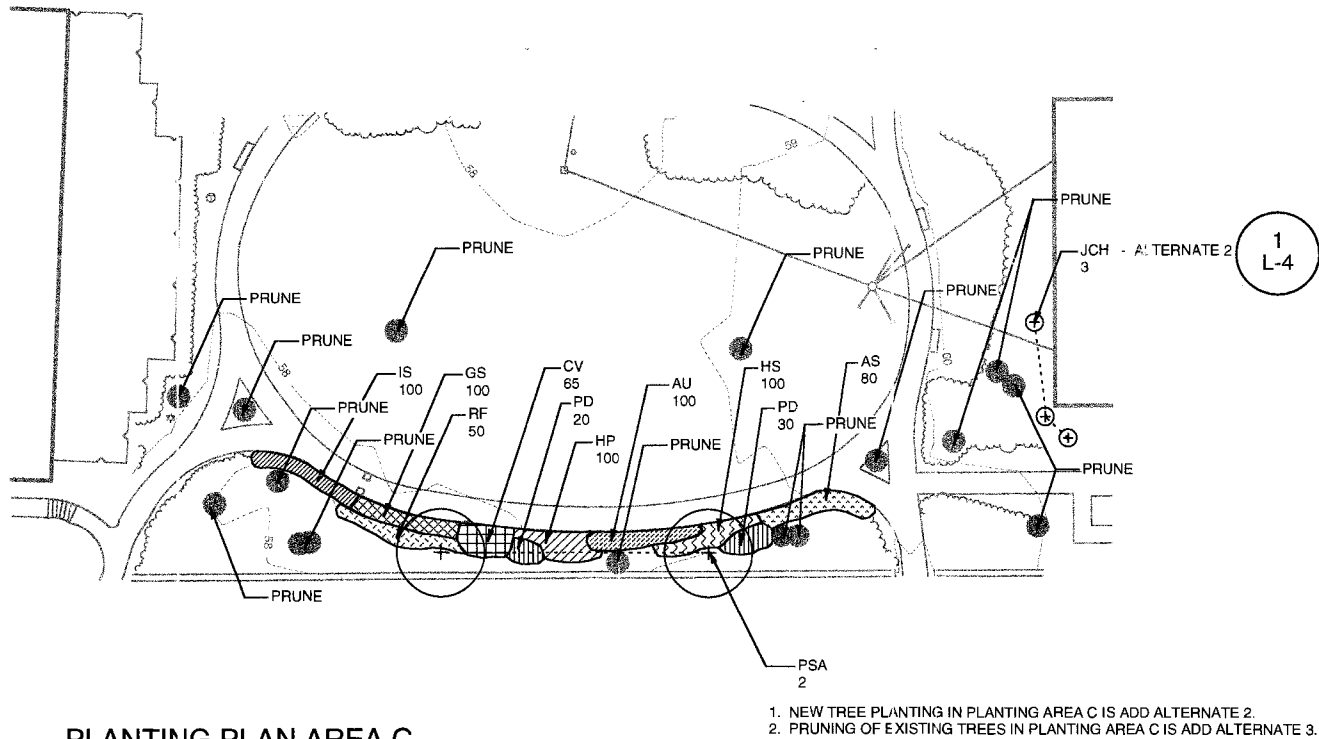
DATE: **3/18/99**

**L-3**

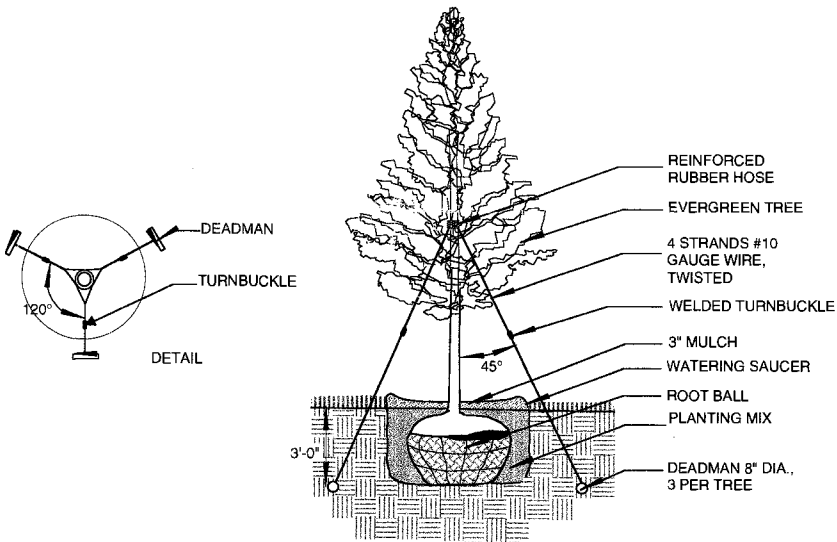
ALTERNATE 2: TREE PRUNING AREA C  
TREE PRUNING SHALL BE FOR FORM AND SAFETY PURPOSES AND DONE UNDER THE SUPERVISION OF  
A MASS. CERTIFIED ARBORIST UNDER THE DIRECTION OF THE LANDSCAPE ARCHITECT.

PLANT LIST DEM AREA C (ALTERNATE 3)						
KEY	BOTANICAL NAME	COMMON NAME	QUAN.	SIZE	ROOT	NOTES
JCH	JUNIPERUS CHIN. HETZI	GREEN COLUMNAR CHINESE JUNIPER	3	6-7' HT.	B&B	SPECIMEN
PSH	PRUNUS SUBHIRTILLA 'AUTUMNALIS'	AUTUMN FLOWERING CHERRY	2	3-3.5' CAL.	B&B	SPECIMEN

PLANT LIST DEM AREA C (ALTERNATE 4)						
KEY	BOTANICAL NAME	COMMON NAME	QUAN.	SIZE	ROOT	NOTES
PERENNIALS						
AS	ANEMONE SYLVESTRIS	SNOWDROP ANEMONE	80	3" POT	CONT	12" O.C.
AU	AURINIA SAXATILIS 'COMPACTUM'	BASKET OF GOLD	100	3" POT	CONT	12" O.C.
CV	COREOPSIS VERTICILLATA 'MOONBEAM'	TICKSEED	65	1" QT	CONT	15" O.C.
GS	GERANIUM SANGUINUM 'ALBUM'	WHITE CRANESBILL	100	#" POT	CONT	12" O.C.
HS	HEUCHERA SANGUINIA 'LEUCHTKAEFER'	CORAL BELLS	100	#" POT	CONT	12" O.C.
HP	HYPERICUM POLYPHYLLUM	ST. JOHN'S WORT	100	3" POT	CONT	12" O.C.
IS	IBERIJS SEMPERVIRENS 'OCTOBER GLORY'	CANDY TUFT	100	3" PT	CONT	12" O.C.
PD	PENSTEMON DIGITALIS 'HUSKER RED'	BEARD TONGUE	50	#" POT	CONT	18" O.C.
RF	RUDBEKIA FULGIDA	BLACK-EYED SUSAN	50	1 QT.	CONT.	18" O.C.



PLANTING PLAN AREA C



1 L-4 EVERGREEN TREE PLANTING  
SCALE: NTS

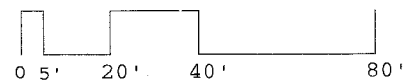
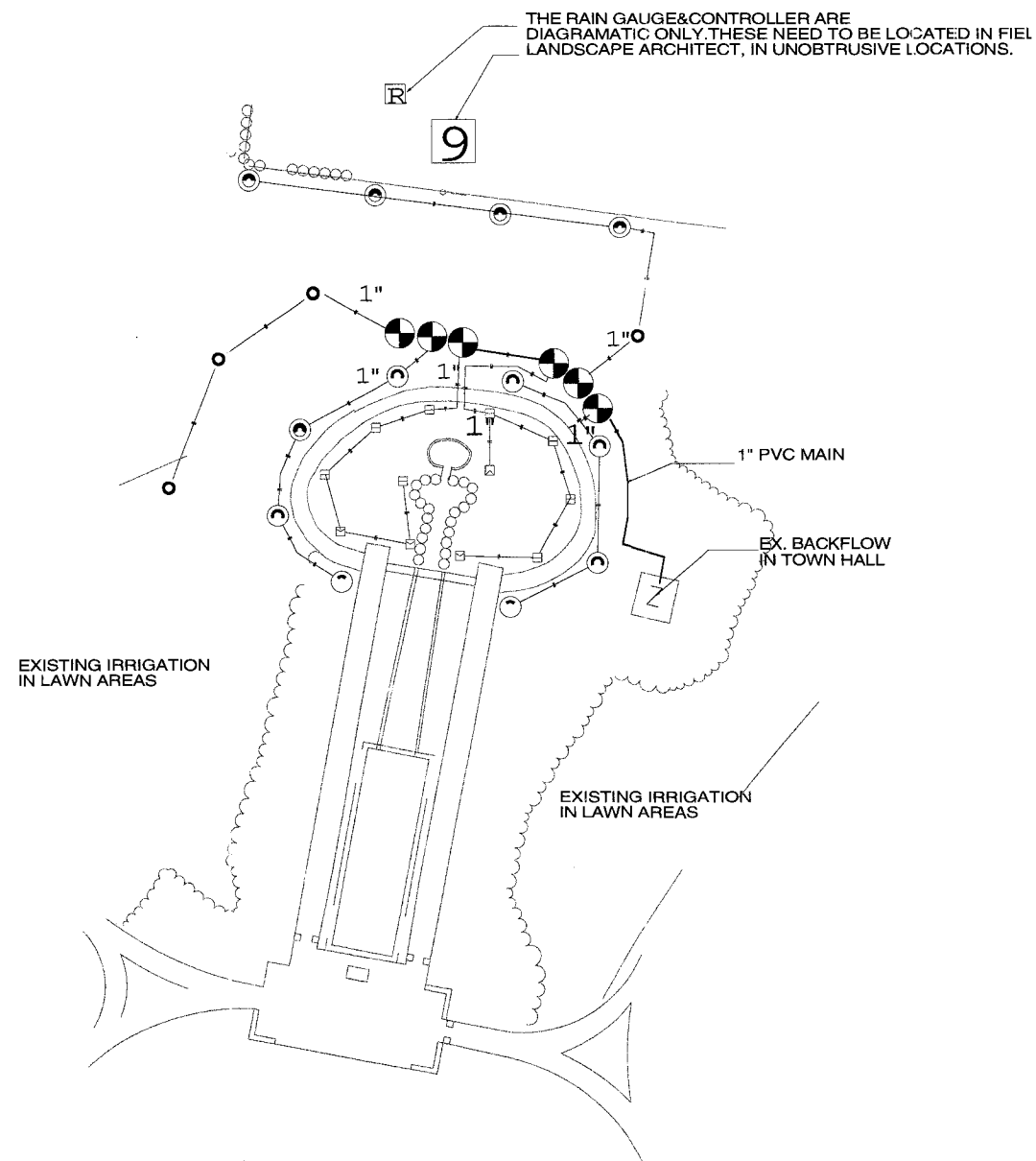
TOWN HALL GARDENS  
HISTORIC RESTORATION - DEM CONTRACT

LANDSCAPE ARCHITECT:  
**PL/LA PAT LOHEED • LANDSCAPE ARCHITECT**  
1310 BROADWAY, SUITE 103  
SOMERVILLE, MA 02144  
617-623-4366 • FAX 617-623-4362



TITLE:  
**PLANTING PLAN  
AREA C**  
DRAWN BY: PL, RJ, JR  
CHECKED BY: PL  
DATE:  
3/18/99

**L-4**



# QTY DESCRIPTION

100'	-	PVC MAIN - CLASS 200 1" SW PVC PIPE
700'	-	POLY LATERALS - 100 PSI 1" POLY PIPE
1	⌘	BACKFLOW ASSEMBLY - FEBCO 825Y 1" RPD ON 1" COPPER
6	⊙	TORO 294-15-04 1" PLASTIC VALVE ASSEMBLY
1	□	TORO RAIN GAUGE MODEL 850-74
1	□	TORO VISION II PLUS CONTROLLER MODEL V2-M09 W/ RAIN GAUGE IN ENCLOSURE
2	⊙	TORO 300 1/4 ARC STREAM ROTOR W/ 03 NOZZLE
4	⊙	TORO 300 1/2 ARC STREAM ROTOR W/ 03 NOZZLE
6	⊙	TORO 300 1/5 ARC STREAM ROTOR W/ 03 NOZZLE
4	•	TORO 300 FC STREAM ROTOR W/ 03 NOZZLE
8	⊙	TORO 570 6" SPRAY HEAD W/ 15-H NOZZLE
3	⊙	TORO 570 6" SPRAY HEAD W/ 15-T NOZZLE
1	⊙	TORO 570 6" SPRAY HEAD W/ 15-TQ NOZZLE

1) SYSTEM IS DESIGNED FOR 16 GPM AT 65 PSI REQUIRED AT THE POINT OF CONNECTION.

## 2) INSTALLATION INSTRUCTIONS:

HEADS: INSTALL ON FUNNY PIPE SWING JOINTS. SET TO GRADE. BACKFILL IN CLEAN MATERIAL. PROPERLY ADJUST THROW, RADIUS, AND HEAD LOCATION SO THE SPRAY IS NOT DISRUPTED BY THE SHRUBBERY.

VALVES: INSTALL 3 PER STANDARD VALVE BOX. USE DBY SPLICE KITS. HIDE VALVE BOXES IN THE LANDSCAPE WHERE POSSIBLE. INSTALL A 1" QUICK COUPLER ON A GALVANIZED TEE IN AN ECONO VALVE BOX FOR BLOW-OUT, AFTER THE RPD.

CONTROLLER: WALL MOUNT IN A MCKINSTRY ENCLOSURE MODEL 56-20126LP WITH THE A.C. UNIT. RUN A DEDICATED, 115 VAC LINE FOR POWER. MOUNT THE RAIN GAUGE AT THE HIGHEST AVAILABLE, COMMON POINT, FACING THE SUN SO THE ELEMENT WILL PROPERLY DRY. CONTROLLER SHALL BE GROUNDED. RUN CONDUIT FOR ALL ABOVE GROUND WIRES, INCLUDING THE WIRES TO THE RAIN GAUGE.

WATER TAP & BACKFLOW: EXISTING TAP IN CONCRETE VAULT AS SHOWN ON THE PLAN. BACKFLOW IS EXISTENT, NIC. ON UNIONS SO IT CAN BE REMOVED IF NECESSARY. ENSURE THAT THERE IS A PROPERLY FUNCTIONING SHUT-OFF VALVE.

PIPE & WIRE: TRENCH OR PULL 12" DEEP. INSTALL PIPE & WIRE IN THE SAME TRENCHES WHERE POSSIBLE.

3) DESIGN IS DIAGRAMMATIC. CONTRACTOR SHALL FIELD LOCATE ALL ITEMS WITHOUT COMPROMISING THE INTEGRITY OF THIS DESIGN. THE SPRINKLER HEAD LOCATIONS SHALL BE CAREFULLY SELECTED IN THE FIELD SO THE SPRAYS OF THE HEAD ARE NOT DISRUPTED BY ANY OF THE PLANTINGS OR SHRUBBERY. USE RISERS WHERE NECESSARY. CONTRACTOR SHALL PROVIDE A 1"=20', ACCURATE PLOT PLAN TO THE OWNER, BEFORE FINAL PAYMENT IS MADE.

4) AVERAGE RUN TIMES PER ZONE: 300- 20 MINUTES PER DAY (MIN/DAY); 570- 8 MIN/DAY. END USER SHALL PROPERLY ADJUST RUN TIMES FOR CHANGING FIELD CONDITIONS.

5) IRRIGATION CONTRACTOR IS RESPONSIBLE FOR, BUT NOT LIMITED TO THE COMPLETE INSTALLATION OF THIS IRRIGATION SYSTEM. FOLLOW ALL APPLICABLE CODES AND LAWS. CONTRACTOR SHALL NOTIFY DIG-SAFE" IN THE STATE OF MASSACHUSETTS PRIOR TO THE COMMENCEMENT OF WORK. IRRIGATION CONTRACTOR WORK INCLUDES: ATTACHING TO THE EXISTING WATER TAP, CONTROLLER AND RAIN GAUGE INSTALLATION, SLEEVING IF NECESSARY, ALL IRRIGATION WORK, AND RELATED ITEMS. THE OWNER SHALL ENSURE THAT THIS WATER SUPPLY IS ADEQUATE ENOUGH FOR THIS SYSTEM (SEE NOTE #1), PROVIDE THE POWER SUPPLY FOR THE CONTROLLER (115 VAC), AND RELATED ITEMS.

System Designed By:

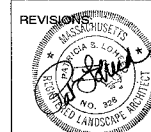
**IDS**  
Irrigation Design Services

157 Moody Road, Enfield, Connecticut  
06082  
Tel: (860) 763-3581 Fax: (860) 763-3550

## TOWN HALL GARDENS DEM CONTRACT Ph 2A

LANDSCAPE ARCHITECT:

☐ PAT LOHEED • LANDSCAPE ARCHITECT  
 1310 BROADWAY, SUITE 103  
 SOMERVILLE, MA 02144  
 617-623-4366 • FAX 617-623-4362



TITLE:

IRRIGATION PLAN  
AREA A

DRAWN BY: PL, JR, EB  
CHECKED BY: PL

DATE:  
3/17/99

L-5



MAPLE STREET

THIS PLAN IS BASED ON THE SURVEY TITLED EXISTING CONDITIONS  
WINFIELD ROBBINS GARDENS BY HOWE SURVEYING ASSOCIATES  
INC. CIVIL ENGINEERS & LAND SURVEYORS, 73 PRINCETON STREET  
NO. CHELMSFORD, MA 01863, (978) 251-3132, DATED 3/05/99.

VERTICAL DATUM BASED ON NGVD 1929 BENCH MARKS HELD  
MASSACHUSETTS HIGHWAY #7737 AND #7738

# EXISTING CONDITIONS LEGEND

---	EXISTING CONTOUR
---	EXISTING INDEX CONTOUR
---	SPOT GRADE
---	CHAIN LINK FENCE
---	BUILDING
---	BOUND
---	BND
---	CATV
---	CB
---	DMH
---	EMH
---	EVGR
---	FLAG
---	GG
---	GW
---	HYD
---	LP
---	MH
---	POST
---	SMH
---	SIGN
---	SLP
---	TMH
---	TREE
---	UP
---	WG
---	EXISTING CONTOUR
---	EXISTING INDEX CONTOUR
---	SPOT GRADE
---	CHAIN LINK FENCE
---	BUILDING
---	BOUND
---	BND
---	CATV
---	CB
---	DMH
---	EMH
---	EVGR
---	FLAG
---	GG
---	GW
---	HYD
---	LP
---	MH
---	POST
---	SMH
---	SIGN
---	SLP
---	TMH
---	TREE
---	UP
---	WG

## ABBREVIATIONS

BC	BOTTOM CURB
BW	BOTTOM WALL
BIT	BITUMINOUS CONCRETE
CONC.	CONCRETE
GRAN.	GRANITE
I	INVERT
R	RIM
TC	TOP CURB
TW	TOP WALL

## LEGEND

---	1 1/2" COPPER PIPE LINE
---	2" PVC PIPE LINE
---	4" PVC PIPE LINE
---	1" PVC ELECTRICAL LINE



0 15 30 60 120  
SCALE: 1" = 30'-0"

## TOWN HALL GARDENS HISTORIC RESTORATION POOLS RECONSTRUCTION PH. 1A

LANDSCAPE ARCHITECT:



**PAT LOHEED • LANDSCAPE ARCHITECT**  
1310 BROADWAY, SUITE 103  
SOMERVILLE, MA 02144  
617-623-4366 • FAX 617-623-4362

REVISIONS:

TITLE:

AS BUILT PLAN

DRAWN BY: JR. JJ  
CHECKED BY: PL

DATE:  
9/99

L-1

MASSACHUSETTS AVENUE

ACADEMY STREET

ARLINGTON TOWN HALL  
3 STORY BUILDING

ROBBINS LIBRARY  
3 STORY BUILDING

2 STORY WOOD HOUSE  
2 STORY 1 STORY WOOD GARAGE

3 STORY  
"WHITEMORE ROBBINS"  
WOOD HOUSE

2 STORY WOOD HOUSE

PORCH

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2 STORY WOOD HOUSE

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2 STORY WOOD HOUSE

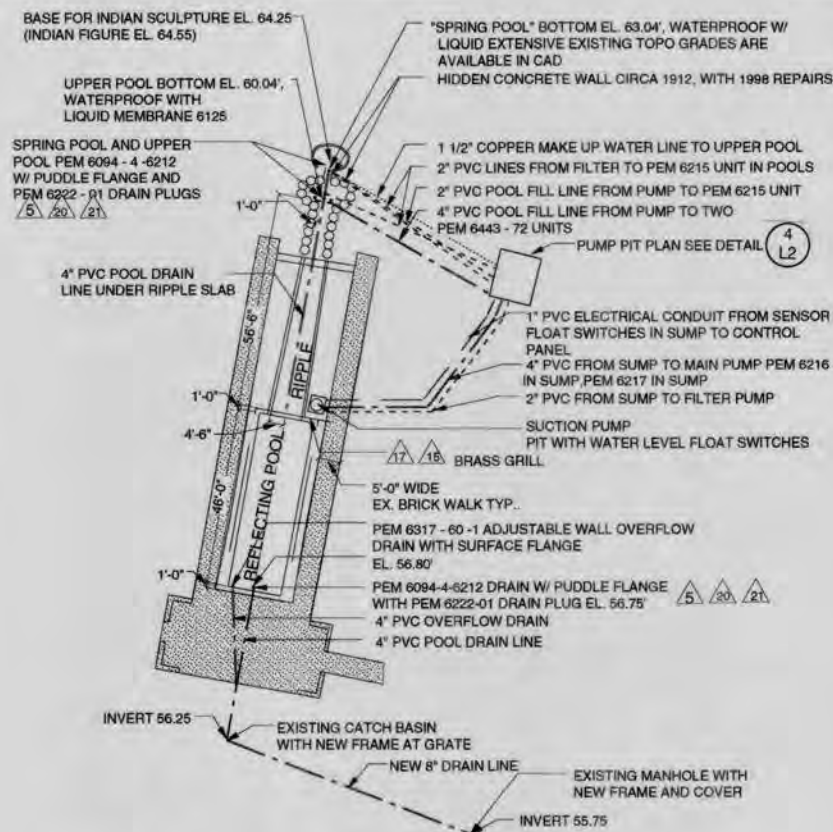
2 STORY WOOD HOUSE

2 STORY WOOD HOUSE

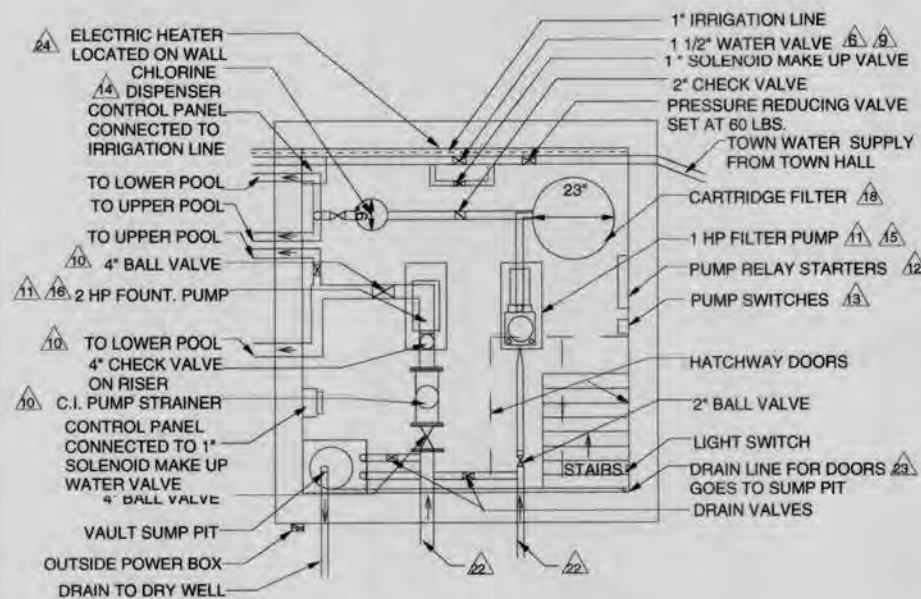
2 STORY WOOD HOUSE

2 STORY WOOD HOUSE

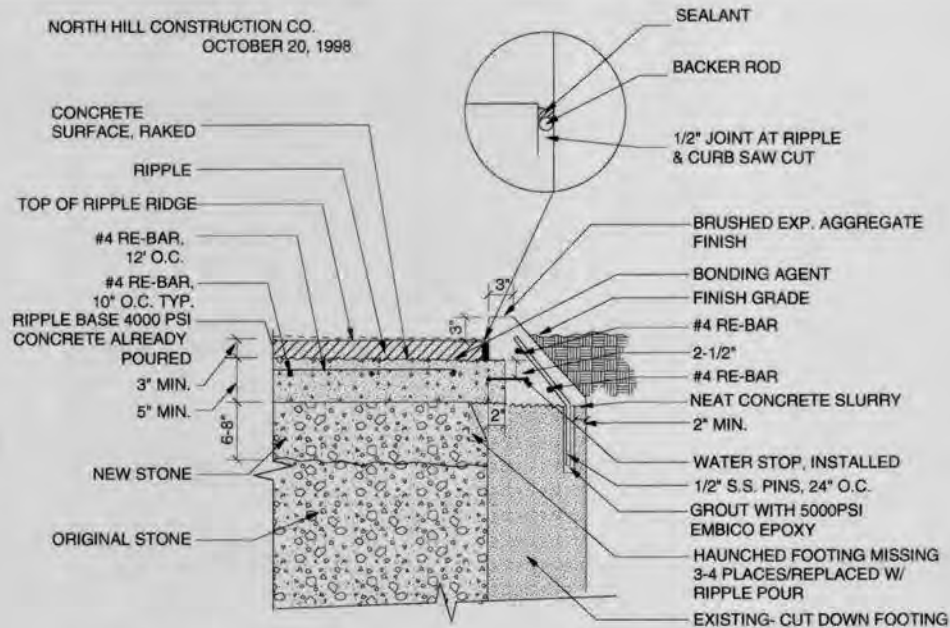
2 STORY WOOD HOUSE



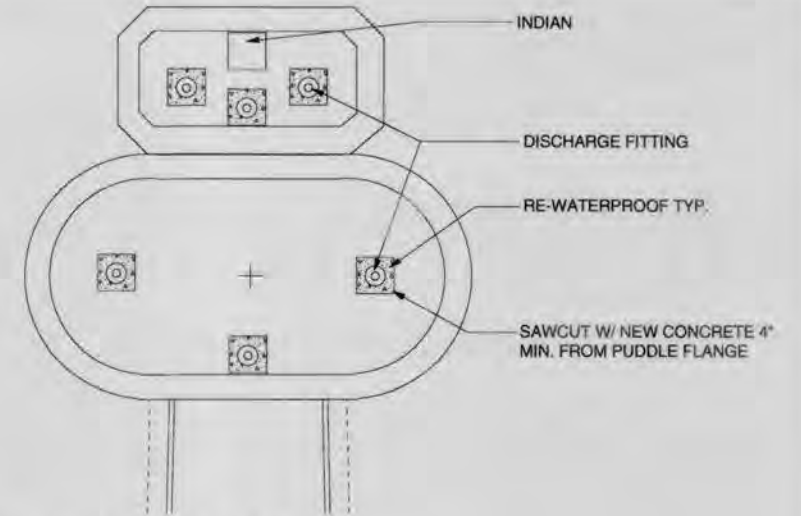
**POOL PLAN ENLARGEMENT**  
SCALE: N.T.S



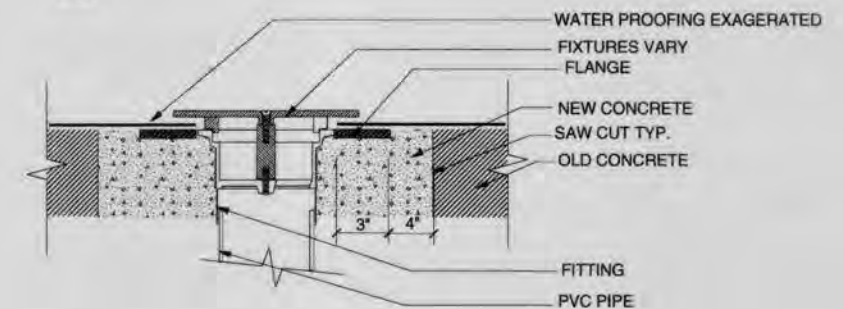
**PUMP PIT PLAN**  
SCALE: N.T.S



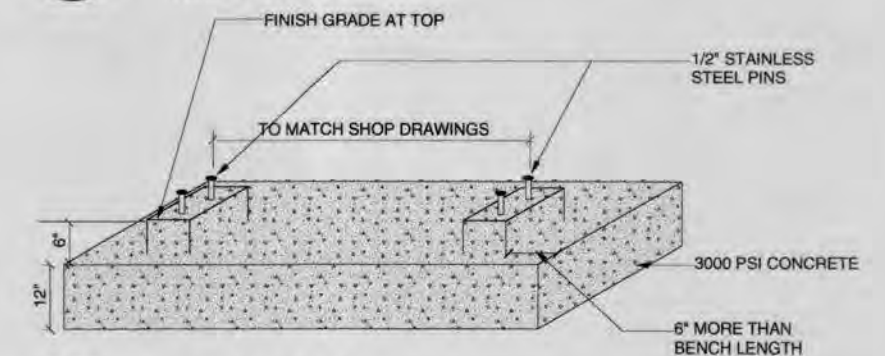
**RIPPLE & RIPPLE CURB SECTION**  
SCALE: N.T.S



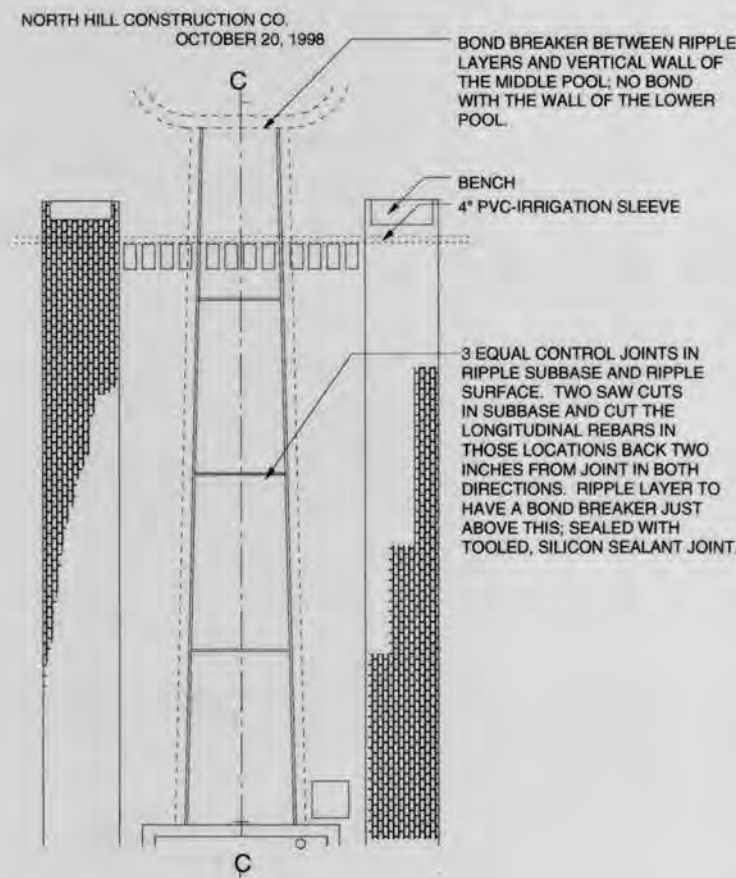
**POOL SKETCH**  
SCALE: N.T.S



**TYP REPAIR SECTION**  
SCALE: N.T.S



**BENCH PADS**  
SCALE: N.T.S



**POOL LAYOUT**  
SCALE: N.T.S

**TOWN HALL GARDENS  
HISTORIC RESTORATION  
POOLS RECONSTRUCTION PH. 1A**

LANDSCAPE ARCHITECT:

**PAT LOHEED • LANDSCAPE ARCHITECT**  
1310 BROADWAY, SUITE 103  
SOMERVILLE, MA 02144  
617-623-4366 • FAX 617-623-4362

REVISIONS:

TITLE:

**AS BUILT DETAILS**

DRAWN BY: JR. JJ  
CHECKED BY: PL

DATE:  
9/99

**L-2**



## 2017 Conditions & Preservation Recommendations

Today, the water features are part of the well-loved gardens in the heart of the Town of Arlington. It has been determined that the Olmsted Brothers' garden design is the period of significance to which the water features and gardens shall be restored. Most design plans from the Olmsted Brothers' design are dated 1939, but the firm's work continued into 1941. Most of this later work included revisions to planting based on specimens that did not survive, but other changes were made to the design of the area immediately around the sculpture, as access to the sculpture was clearly an issue. *(We hope to have more on this topic when the correspondence from the Olmsted Associates Records are received from the Library of Congress.)*

### Menotomy Indian Hunter sculpture and base

The sculpture has some paint on the face and back of the figure. The broken bow is to be repaired by Skylight Studios of Woburn, MA. The base has lost nearly all of the stone veneer and the waterproofing has peeled away. There is no longer lighting for the sculpture though it was included in both the 1939 and 1999 plans.

#### Recommendations:

- Consider lighting sculpture to discourage vandalism and misuse. Use existing conduit and replace fixture for LED.
- Remove liquid membrane waterproofing, clean concrete plinth, reset stones based on Olmsted design. Use 1999 restoration images as resource.
- Restore bronze bow to sculpture (underway).
- Remove paint on sculpture (front and back).
- Consider installing fencing at rear of sculpture to limit access. See Olmsted Brothers' Plan No. 50 for reference.

### "Spring" with stone spillway

The "spring" is the source of the water for the feature. Today the pool is very dark and filled with debris, including trash, leaves, and fruit from the walnut trees. Nearly all of the stones which were placed vertically have fallen, and others are loose with exposed mortar, and infill, including bricks. The concrete basin is exposed in several locations.

#### Recommendations:

- Remove any remnants of original fountain mechanical system. New fountain hardware should not be visible after the completion of construction.
- Remove all vegetative debris.
- Remove liquid membrane waterproofing, clean concrete basin, clean stones of mortar and other infill. Remove and dispose of waterproofing. Reapply waterproofing after cleaning on concrete.
- Reset stones based on Olmsted brothers' design. Consider pinning or other system of keeping the stones from sliding or falling. Whatever system is selected for securely mounting the stones, must not be visible after construction.



- Set water height to be just below hand of sculpture. See Olmsted Plan No. 33 and image 2252-01-83, dated September 1939, below. Water level is just above the base of elevation of the bronze base set on the concrete.
- Develop maintenance program to regularly clean leaves and walnuts from the pools.



*Image 2252-01-83, dated September 1938; Courtesy of Olmsted Archives, Frederick Law Olmsted National Historic Site, NPS*

### Upper pool

The condition of the upper pool is similar to that of the spring. The water is very dark in color, with considerable vegetative debris. The stones in the upper pool appear to have weathered better with fewer having been dislodged.

#### Recommendations:

- Remove liquid membrane waterproofing, clean concrete basin, clean stones of mortar and other infill. Remove and dispose of waterproofing.
- Reapply waterproofing after cleaning on concrete. Waterproofing, mortar (minimally), and concrete should not be visible after installation.
- Reset stones based on Olmsted design.
- Water level is determined by the elevation of the ripple spillway.

# TOWN HALL GARDEN WATER FEATURES RESTORATION

## Ripple spillway with stepping stones

The ripple was restored as part of the 1999 project and is in good condition. There are areas where it appears that skateboards have run over the ripples damaging some of the profile. The sealant between the curb and ripple has worn away leaving a gap collecting debris. Two of the bluestone stepping stones are broken and all of them are loose.

### Recommendations:

- Replace two broken bluestone stepping stones to like size, color, and finish
- Re-mortar all bluestone stepping stones and consider a more permanent method of securing them in place
- Re-caulk between ripple spillway and concrete curb. Color to be approved in field.
- Remove expansion joint caulking and replace.
- Repair damage to ripples from skateboards
- Protect custom manhole cover

## Lower pool with bluestone coping

The lower pool is in poor condition. The skim coating that was applied in the 1998-1999 restoration has failed and is exposing the original concrete wall, reinforcing and infill material. The depth of the pool varies (from 15.25" to 16" at the northern end) due to the thickness of the skim coating. The overhang of the bluestone coping varies greatly all the way around the pool from ¼" to 1-1/2". The pool is much shallower than originally designed (2'-3") which leads to the assumption that there may have been a later pour of concrete over the original from 1913. The drain installed in the 1998-1999 (or a subsequent repair) restoration is bright yellow and is in sharp contrast to the concrete making it distracting.



1911 image of lower pool; Courtesy of Digital Commonwealth: Massachusetts Collections Online



Image of children sailing boats at the lower pool, no date; Courtesy of Digital Commonwealth: Massachusetts Collections Online

The bluestone coping stones appear to be in relatively good condition and none appear to be out of place. Olmsted Brothers' Plan No. 25 suggests that the coping stones have a central dowel keeping them in line. In the event that these dowels are in place, great care should be taken to ensure that the coping stones are not damaged during their removal. No historic records have been uncovered which detail the depth of the water in either from Sturgis or the Olmsted Brothers. In historic images the water level appears to be just below the coping stone. (See images above.)

### Recommendations:

- Remove, catalog, and clean bluestone coping of all mortar, paint, or other materials.
- Demolish existing cast-in-place concrete basin and skim coating.
- Restore coping to original 3/4-inch reveal on both sides of pool wall.
- Recast the lower basin, with finish to match historic exposed aggregate concrete finish.
- Reset bluestone coping based on cataloging.
- Restore water level to just below coping stones.
- Replace modern drain covers with metal drain covers with an appropriate finish that will withstand the chlorinated water, if treated, and will not be in contrast to the concrete.

### Brick walkways and forecourt

For the most part, the brick walkways and forecourt are in fair condition and free of tripping hazards, though there is an occasionally brick missing. However, the brick soldier course edging is no longer vertical and the crown is too pronounced to meet ADA Accessibility Guidelines. Most of the joints between the bricks are growing grass and weeds and some have expanded such that brick pieces have been inserted.

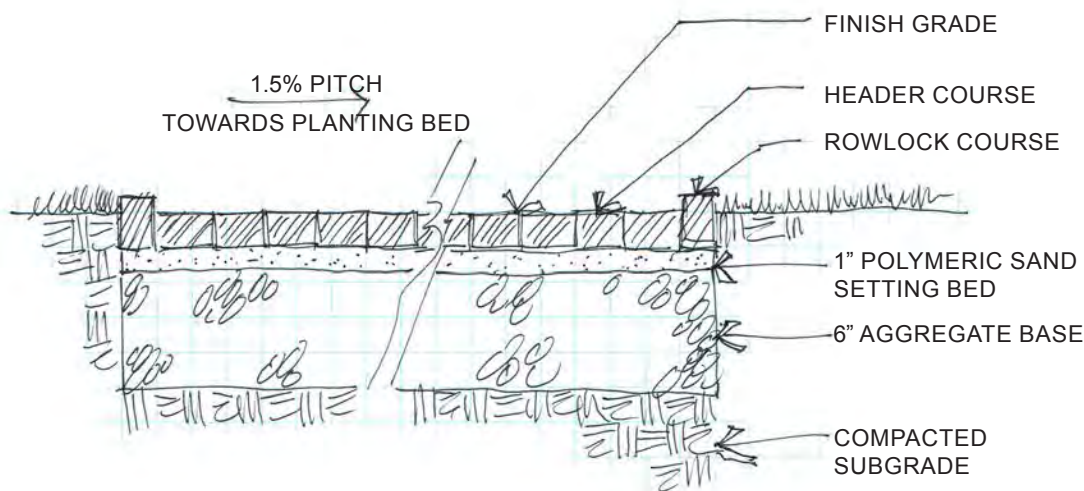
In order to complete the upgrades for the water feature's mechanical system, utility lines will likely cut across the brick walkways requiring some level of repair. In addition, as part of the restoration project, a cover for the lower pool and spillway is being proposed. The detail being proposed for the cover to be secured will impact the brick walkways. The demolition and construction of the lower basin will require removal of much of the brick walkways. Because of Sturgis' design for the brick walkways includes a 3.0% crown, as well as border bricks laid in a soldier course, it will be extremely difficult to repair portions of the walkways without disrupting large portions of the walkways. For these reasons, it is recommended that the brick walkways flanking the water feature be removed and reset, reusing the existing brick as much as possible. Also, the brick walkways were designed with a drainage system integral to the cross-section, the drainage system will likely also have to be reconstructed (or eliminated), however, this will provide an opportunity to simplify the drainage by eliminating the crown in the walk and creating a cross-pitch to one side or the other.

The Arlington Civic Block Master Plan proposed options for the redesign of the brick paving and drainage detail. However, it is likely that a drainage system is unnecessary for these walkways flanking the water feature. The walkways are six feet wide and are surrounded by planting beds. It is recommended that the walkways be pitched towards the woodland planting with a cross-pitch of no more than 2.0%. It is also recommended that the border brick be changed to a header course so that it will be less likely to settle out of plumb.

# TOWN HALL GARDEN WATER FEATURES RESTORATION

## Recommendations:

- Reset brick walkways to ensure accessibility, eliminate tripping hazards, and ensure positive drainage. Consider brick walkway detail shown below.
- Minimize disturbance to brick forecourt.
- Protect memorial stone in forecourt.
- As a long term recommendation: Reset brick forecourt and connecting pathways based on redesign of brick walkways.



*Recommended cross-section for brick paving*

## Circular cobble walkway

The circular cobblestone walkway is in good condition but does have some missing stones which, given their depth, are a significant tripping hazard. The joints are growing grasses and weeds.

## Recommendations:

- Replace missing cobblestones where necessary (short term)
- Remove grass in joints and sweep with a sand/cement mixture (long term)

## View up to and from sculpture

Many of the plantings have grown beyond the limits of the planting bed and are therefore screening portions of the water features and woodland planting. Above the brick walkways, the dogwoods' branching significantly encroaches the walkway therefore screening the sculpture from view and creating the potential for debris to fall on the walk or visitors.





*View from brickwaly with dogwood limbs blocking view of sculpture*



*View of sculpture with utility cabinet cluttering the backdrop to the sculpture*

A utility cabinet and chain link fence is located directly behind the sculpture — part of the Arlington Senior Center/Central School facility. These are visible from the pools and detract from the sculpture and its woodland setting. They should be carefully screened with the Olmsted Brothers' evergreen shrub palette so as not to be seen from the memorial gardens.

### Recommendations:

- Prune trees to remain to open up views to woodlands and sculpture from brick walkways and forecourt.
- When replanting dogwoods, consider offsetting the plants further from the brick walkways.
- Use appropriate vegetation from the Olmsted Brothers' planting palette to screen the utility cabinet and chain link fence from the memorial gardens.

## Woodland planting behind sculpture

The rock wall which supports the slope behind the sculpture and cobble loop is covered in wintercreeper. Other plant species in this area include *Euonymus alatus*, burning bush which has been listed as an invasive plant species in Massachusetts, seven *Pinus strobus*, white pine (one of which appears to be in poor condition), and one *Acer platanoides*, Norway maple, which is also an invasive species in Massachusetts. There is also one *Morus alba*, white mulberry (another Massachusetts listed invasive species) growing near the path to the Robbins Library. Additional plants in this area include one spreading *Taxus spp.*, yew; *Prunus spp.*, cherry trees – mostly young trees; and, *Spiraea spp.*, spirea.

The Olmsted Brothers' design for this planting area works off of the plantings proposed by the Sturgis plan, but it appears as though many of the trees on the Sturgis plan either did not survive or were ever planted. Plan No. 16-A denotes only a dozen or so existing trees which vary from 3 inches to 16 inches in caliper. (This is confirmed by Plan No. 15, entitled "Topographical Map", dated October 25, 1938 which appears to show that the Olmsted Brothers' planting plan did not remove any existing trees.) The Olmsted Brothers' plan is heavy on three species of evergreen trees: *Pinus strobus*, white pine; *Tsuga canadensis*, eastern hemlock; and *Juniperus virginiana*, eastern red cedar. The understory plantings are a mix of deciduous and evergreen shrubs but also rely more heavily on evergreen species. The perennial species are "to be planted in the interstices and along the top of the boulder work" as noted on Plan No. 16-A. It is also worth noting that only one birch tree remaining (approximately 30" caliper DBH) from the Sturgis and/or Olmsted Brothers' planting.

On the east side of the woodland planting is the ornate metal fence which is historic to the Whittemore-Robbins House. The fence has been restored over the years and should be protected from damage.

## Recommendations:

- Protect the ornamental metal fence from all construction activities.
- Remove all invasive species before they have the opportunity to spread throughout the gardens and create a significant management problem.
- Remove all dead or dying plantings, as well as deadwood.
- Protect all trees and shrubs to remain from construction damage.
- Replant according to Olmsted Brothers' planting plan No. 16-A and 16-B, both dated May 26, 1939. The plant species include the following:

(All plant names discussed in this section have been converted to modern botanical names. Plants have been listed in the following order: trees, shrubs, vines/groundcovers, perennials. Where multiple species are listed as a single line item, they were listed similarly on Olmsted Brothers' plant lists.)

- *Pinus strobus*, white pine
- *Tsuga canadensis*, eastern hemlock - Species not recommend due to mortality rate from woolly adelgid
- *Juniperus virginiana*, eastern red cedar
- *Cornus florida*, flowering dogwood - Recommend substituting a disease-resistant hybrid

- *Cotoneaster dielsiana*, Chinese cotoneaster - May be difficult to locate in commercially nurseries
- *Cotoneaster adpressus*, creeping cotoneaster/*Cotoneaster horizontalis* 'prostrata', prostrate rockspray cotoneaster
- *Juniperus chinensis* 'pfiteriana', pfitzer juniper
- *Vaccinium corybosum*, highbush blueberry
- *Rhododendron maximum*, rosebay rhododendron
- *Kalmia latifolia*, mountain laurel
- *Ligustrum spp.*, privet - Invasive species in Massachusetts; cannot be planted
- *Berberis thunbergiana*, Barberry - Invasive species in Massachusetts; cannot be planted
- *Juniperus chinensis*, Chinese juniper/*Juniperus horizontalis*, rug juniper/*Juniperus horizontalis* 'douglasii', Douglas juniper
- *Phlox subulata* 'alba', white moss phlox
- *Thymus serpyllum* 'album', white creeping thyme/*Thymus serpyllum* 'langinosus', woolly thyme
- Existing species noted on the Olmsted Brothers' plans include *Betula pendula*, white birch; *Pinus strobus*, white pine; and, *Fraxinus spp.*, ash.
- Use appropriate vegetation from the Olmsted Brothers' planting palette to screen the utility cabinet and chain link fence from the memorial gardens.

### Planting within cobbles walk around sculpture

Today the woodland planting behind the Dallin sculpture is comprised mainly of taxus shrubs and wintercreeper vines which are consistent with the 1999 planting by Pat Loheed's (PL/LA) office. Of the four mountain laurels shown on the PL/LA plans, only one remains. Behind the sculpture are two large walnut trees – approximately 30" and 46" diameter breast height (DBH) which predate the Olmsted Brothers' work. One cherry tree also exists which may be a volunteer as it does not show up in any plans.

This is, perhaps, the most significant of the planting areas as it is directly surrounding the sculpture and creates its woodland context that is essential to the Olmsted Brothers' design intent. This area should be a priority for restoration of the original palette. The Olmsted Brothers' planting palette will have much greater species diversity, will reflect the original design intent, and recreates the woodland setting for the sculpture in a mix of evergreen and deciduous species.

### Recommendations:

- Selectively remove and dispose of yews and wintercreeper to work within the Olmsted Brothers' planting plan.
- Remove any other plantings that do not conform to Olmsted Brothers' planting plan. Species that can be relocated according to Olmsted Brothers' planting plans should be carefully removed for transplant.



## TOWN HALL GARDEN WATER FEATURES RESTORATION

- Protect walnut trees but establish routine maintenance plan to remove leaves and fruit from all water features and walkways.
- Replant according to Olmsted Brothers planting plan No. 16-B, dated May 26, 1939. The plant species include the following:
  - *Betula papyrifera*, paper birch
  - *Tsuga canadensis*, eastern hemlock - Species not recommend due to mortality rate from woolly adelgid
  - *Cornus florida*, flowering dogwood - Recommend substituting a disease-resistant hybrid
  - *Juniperus virginiana*, eastern red cedar
  - *Taxus cuspidata*, Japanese yew
  - *Juniperus chinensis* 'pfiteriana', pfitzer juniper
  - *Juniperus chinensis* var. *sargentii*, Sargent's juniper
  - *Juniperus chinensis*, Chinese juniper/*Juniperus horizontalis*, rug juniper/*Juniperus horizontalis* 'douglasii', Douglas juniper
  - *Rhododendron yedoense* var. *poukahensis*, Korean azalea
  - *Dirca palustris*, eastern leatherwood
  - *Euonymous fortunei* var. *radicans*, common wintercreeper - Species not recommended due to aggressive nature
  - *Pieris floribunda*, mountain andromeda
  - *Kalmia latifolia*, mountain laurel
  - *Vaccinium corybosum*, highbush blueberry
  - *Cotoneaster adpressus*, creeping cotoneaster/*Cotoneaster horizontalis* 'prostrata', prostrate rockspray cotoneaster
  - *Arctostaphylos uva-ursi*, bearberry
  - *Pachysandra terminalis*, Japanese spurge
  - *Hemerocallis* spp., daylily
  - *Dryopteris marginalis*, marginal shield fern
  - *Dryopteris spinulosa*, toothed wood fern
  - *Polystichum acrostichoides*, Christmas fern
  - *Arisaema triphyllum*, Jack-in-the-pulpit
  - *Phlox subulata* 'alba', white moss phlox
  - *Thymus serpyllum* 'album', white creeping thyme/*Thymus serpyllum* 'langinosus', woolly thyme
  - Existing plantings shown on the 1939 Olmsted Plan No. 16-B also include *Pinus strobus*, white birch; *Ailanthus altissima*, tree of heaven - an listed invasive species in Massachusetts; a twin-trunk *Tsuga canadensis*, hemlock; as well as one *Juglans nigra*, black walnut.
- Cut existing stumps flush to grade and treat with herbicide.



## Spillway planting

The 1999 Pat Loheed plans show a simple palette for the planting beds between the ripple spillway and the brick walkway: six *Picea glauca* 'conica', dwarf Alberta spruce (three each side) and *Pachysandra terminalis*, Japanese spurge. (The *Picea glauca* 'conica' is assumed as it does not show up on the plant schedule in the plan set, however, this is what was included in the Olmsted Brothers' Plan No. 16-A but only with two on each side.) Today there are five *Taxus* spp., yew in lieu of the spruces — one has died since the 1999 restoration. The beds also have some *Onoclea sensibilis*, sensitive fern growing.

In the Olmsted Brothers' planting plan, the flanking beds were planted with *Pachysandra terminalis*, Japanese spurge; *Cotoneaster adpressus*, creeping cotoneaster and *Cotoneaster horizontalis* 'prostrata', prostrate rockspray cotoneaster. *Pachysandra* is an aggressive, shade-tolerant, evergreen groundcover. It can quickly fill in a planting area, similar to the wintercreeper that has filled in other planting beds in the memorial gardens. In this location, between the brick walkways and the spillway, they are (almost) literally between a rock and a hard place and will likely not spread out of control if carefully maintained.

During a mid-fall visit, small *Fallopia japonica*, knotweed was observed; a Massachusetts listed invasive species.

### Recommendations:

- Remove and dispose of yews. Protect existing Japanese spurge. Remove any other plantings that do not conform to Olmsted Brothers' planting plan. Species that can be relocated according to Olmsted Brothers' planting plans should be carefully removed for transplant.
- Replant according to Olmsted Brothers planting plan No. 16-A, including two *Picea glauca* 'conica' on either side and a groundcover planting comprised of Japanese spurge and the two cotoneaster species.

## Planting along lower basin

Today, these long, narrow planting beds are filled with *Sedum* spp. and *Astilbe* spp. with a few *Aster* spp. mixed in. (No plantings are shown in this area in the 1999 PL/LA plans.)

The Olmsted Brothers' planting plan fills these beds with mostly *Pachysandra terminalis*, Japanese spurge and select groupings of *Cotoneaster adpressus*, creeping cotoneaster and *Cotoneaster horizontalis* 'prostrata', prostrate rockspray cotoneaster. Cotoneaster will eventually grow to have a spread of up to six or eight feet depending on the species. These plantings, unless regularly and heavily pruned, will quickly grow beyond the limits of the three-foot wide planting strip.

Since the town hall gardens is a popular wedding venue, blooming perennials are likely popular to have as part of the backdrop for ceremonies and photographs. This may be, therefore, the one location in which to deviate from the Olmsted Brothers' planting plans in order to provide additional color and interest. Reintroducing the *Pachysandra* in this location should not be an issue with sufficient maintenance, similar to the location above between the spillway and brick walkways.

# TOWN HALL GARDEN WATER FEATURES RESTORATION

## Recommendations:

- Maintain the existing sedum and astilbe plantings to maintain fall and spring blooms. Remove all other perennial plantings which are likely volunteer species from elsewhere in the gardens. As perennials need to be replaced, consider attractive blooming perennials that are consistent with a woodland-style planting palette.
- Reintroduce limited *Pachysandra* to incorporate evergreen for winter and to incorporate some of the Olmsted design intent.

## Border planting outside brick walkways

The woodland style plantings continue outside the brick walkways on either side following the spillway and lower pool. These planting beds are dominated by dogwoods (*Cornus* x 'Rutlan' Ruth Ellen, *C.* x 'Rutgan' Stellar Pink, *C.* x 'Rutban' Aurora) with an understory planting of *Rhododendron* x 'Delaware Valley White', Delaware Valley white azalea; *Rhododendron yedoense* var. *poukahensis*, Korean azalea; *Taxus cuspidata* 'Greenwave', greenwave yew; *Pachysandra terminalis*, Japanese spurge; and, *Campanula carpatica*, bellflower. These were the plants installed in the 1999 restoration, with the exception of the mountain laurel which may be from the Olmsted Brothers' planting – several of which are in poor condition. Additional trees include *Malus* spp., crabapple, and one tree-form *Taxus cuspidata*, Japanese yew which may have been mislabeled as a greenwave yew at the nursery but appears to be the straight species.

There are a few different invasive species in both the east and west planting beds: *Ailanthus altissima*, tree of heaven; *Euonymus alatus*, burning bush; *Ligustrum* spp., privet; *Morus alba*, white mulberry; *Berberis* spp., barberry; and, *Cynanchum rossicum*, pale swallow-wort. *Vitis* spp., wild grape is not listed as an invasive species in Massachusetts but other northeast states have listed it due to its aggressive nature.

The Olmsted Brothers' planting for these beds flanking the water feature were dominated by two species: *Taxus cuspidata* 'brevifolia', dwarf Japanese yew and *Cornus florida*, flowering dogwood (large specimens). The Olmsted Brothers' plans had seven yews and six dogwoods per side. The beds would have been more light with the vast majority of the species being shrubs. Today's planting is dominated by tall shrubs/small trees which are dense and effectively create a vertical wall around the gardens.

## Recommendations:

- Remove all dead or dying plantings. Remove all plants with less than 50% healthy, balanced branching structure that show viable terminal buds.
- Undertake extensive pruning on existing dogwoods, both for removal of dead wood and for viewshed management.
- Replant according to Olmsted Brothers planting plan No. 16-B, dated May 26, 1939. The plant species include the following:
  - *Cornus florida*, flowering dogwood - Recommend substituting a disease-resistant hybrid
  - *Cornus florida* 'rubra', red-flowering dogwood - Same as above
  - *Taxus cuspidata* 'brevifolia', dwarf Japanese yew - Recommend selecting a modern equivalent
  - *Rhododendron yedoense* var. *poukahensis*, Korean azalea

- *Kalmia latifolia*, mountain laurel
- *Pieris floribunda*, mountain andromeda
- *Myrica pennsylvanica*, northern bayberry
- *Juniperus chinensis*, Chinese juniper/*Juniperus horizontalis*, rug juniper/*Juniperus horizontalis* 'douglasii', Douglas juniper
- *Cotoneaster wilsonii*, wilson cotoneaster/*Cotoneaster horizontalis*, rockspray cotoneaster
- *Pachysandra terminalis*, Japanese spurge

### Wooded planting around mechanical vault

The plantings around the vault continue the woodland planting palette but has two substantial trees as the planting backbone: one *Magnolia x soulangeana*, saucer magnolia and one multi-leader *Prunus spp.*, cherry tree (potentially a Kwanzan cherry as they were included on the Olmsted Brothers' planting list.) The understory planting is mainly *Kalmia latifolia*, mountain laurel; *Rhododendron spp.*, rhododendron; and, a small tree/tall shrub *Magnolia spp.* — potentially a star magnolia. A few *Leucothoe spp.* are in the understory, yet these do not show up in the Olmsted Brothers' planting palette, nor the 1999 PL/LA plans. (In fact, the PL/LA did not propose any plantings in this area at all.)

Little of this planting palette reflects that of the Olmsted Brothers'. Their planting included three of the *Magnolia x soulangeana*, saucer magnolia, a *Magnolia stellata*, star magnolia with several shrubs in the understory.

### Recommendations:

- Protect existing leucothoe plantings
- Prior to beginning any construction activities in and around the mechanical vault, lift and secure limbs of existing magnolia and cherry trees to prevent damage. Work must be completed by a Massachusetts certified arborist.
- Restore Olmsted Brother's planting plan No. 16-A. Species included:
  - *Magnolia stellata*, star magnolia
  - *Spiraea x vanhouttei*, Bridalwreath spirea
  - *Malus hupehensis*, tea crabapple
  - Roses — no form species, or cultivar/variety noted
- If the mechanical vault is reduced in size, expand plantings in the vicinity, using species from the Olmsted Brothers' planting palette.

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